"TO ANALYZE THE PREOPERATIVE RESPIRATORY STATUS AND POSTOPERATIVE RESPIRATORY COMPLICATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS UNDERGOING ABDOMINAL SURGERY IN A TERTIARY CARE HOSPITAL"

Dissertation submitted to The Tamil Nadu Dr.M.G.R. Medical University in partial fulfilment of the requirements for the degree of

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Branch – XVII

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Madras Medical College &

Rajiv Gandhi Government General Hospital

The Tamil Nadu Dr. M.G.R. Medical University

Chennai – 600032

Tamil Nadu

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MAY 2018

BONAFIDE CERTIFICATE

This is to certify that the dissertation titled **"TO ANALYZE THE PREOPERATIVE RESPIRATORY STATUS AND POSTOPERATIVE RESPIRATORY COMPLICATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS UNDERGOING ABDOMINAL SURGERY IN A TERTIARY CARE HOSPITAL"** is the bonafide work done by **Dr.RAMKUMAR.P.P** during his **M.D (Tuberculosis and Respiratory Diseases)** course in the academic years 2015-2018, at the Institute of Thoracic Medicine and Rajiv Gandhi Government General Hospital – Madras Medical College, Chennai. This work has not previously formed the basis for the award of any degree.

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DECLARATION BY THE GUIDE

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1. CONTENTS

INTRODUCTION

According to Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines, COPD is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and /or alveolar abnormalities usually caused by significant exposure to noxious particles or gases.

Global prevalence of COPD is 11% [2] and is a common co-morbidity in patients undergoing surgery. COPD is a well known independent risk factor for development of postoperative pulmonary complications after abdominal surgery. From various studies the incidence of postoperative pulmonary complication in COPD patients undergoing abdominal surgery is between 15%-30% [3, 4, 5, 6]. Prevalence of COPD in India is 4% [7] and the incidence of postoperative pulmonary complication in COPD patients undergoing abdominal surgery is 21 % [8].

. Most common postoperative pulmonary complication in COPD patients undergoing abdominal surgery is respiratory failure followed by pneumonia and atelectasis. Many factors are associated with the development of postoperative pulmonary complication. They includes preoperative factors (chronic lung disease, smoking, age, obesity, nutritional status, antecedent respiratory tract infection, general health status, preoperative Spo2 and haemoglobin level) and intraoperative factors (emergency nature of the procedure, type and duration of anaesthesia, location of surgical site , type of surgical incision, intraoperative blood transfusion).

Risk prediction models use preoperative factors to identify patients at high risk of developing postoperative pulmonary complications. These models are useful to stratify risk when advising patients before surgery and to identify patients most likely to benefit from risk-reduction interventions. The risk prediction models are

1. ARISCAT risk index which predicts the overall incidence of postoperative pulmonary complications.
2. Two Gupta risk calculators will be helpful to establish the risk of a single complication, either pneumonia or respiratory failure.
3. The Arozullah respiratory failure index predicts the incidence of postoperative respiratory failure.

Postoperative pulmonary complications are one of the most important causes of postoperative morbidity and mortality.

Postoperative pulmonary complications were the most costly of major postoperative medical complications and resulted in the longest length of hospital and ICU stay [3]. Postoperative mortality due to pulmonary complications was 6.7% in COPD patients [3, 4].

This study aimed to analyse the postoperative pulmonary complications and its associated preoperative and intraoperative risk factors in COPD patients undergoing abdominal surgery.

REVIEW OF LITERATURE

Postoperative pulmonary complications is defined as pulmonary abnormality that produces identifiable dysfunction or disease postoperatively that is significant clinically and adversely affects the clinical course [9].

The various possible postoperative pulmonary complications considered were as

- Pneumonia
- Atelectasis
- Respiratory failure
- Pleural effusion
- Exacerbation of COPD
- Pulmonary Embolism

PERIOPERATIVE PULMONARY PHYSIOLOGY:

Reduced lung volume after surgery is a major factor to the development of postoperative pulmonary complications. Upper-abdominal and thoracic surgeries are associated with a reduction in lung volumes in a restrictive pattern as follows [10,11]:

●Vital capacity (VC) is decreased by 50% to 60%

●Functional residual capacity (FRC) is decreased by 30%

Both remain decreased for up to one week post surgery.

Diaphragm dysfunction is an important factor in reduction of postoperative lung volume, postoperative pain and splinting also contributes.

In a normal lung, FRC is always greater than closing capacity, and the airways remain open throughout a tidal breath. However, when CC is greater than FRC like in COPD, smoking, advanced age lung volume fails to increase sufficiently during tidal breathing to open all the airways and, consequently, some alveolar units remain closed during a breath. This causes development of areas of low ventilation-to-perfusion ratio and atelectasis leading to impaired gas exchange with consequent postoperative hypoxemia. In patients who continue to smoke the contributing factors include impaired ciliary function and chronic tracheobronchitis.

Residual effects of anaesthetic agents and postoperative opioids both depress the respiratory drive and reduce the ventilatory response to hypercapnia, hypoxia, and acidosis. Cough and mucociliary transport are compromised after abdominal surgery, contributing to an increased risk of pulmonary infection.

Pulmonary complications occurs more often with thoracic and upper abdominal surgeries compared to surgeries involving the lower abdomen or extremities due lesser degree of lung volume reduction.

In a study using the National Surgical Quality Improvement Program (NSQIP) database including 450,000 patients, unadjusted rates of postoperative prolonged ventilation, reintubation and pneumonia among patients with COPD were 8.8 %, 5.5 % and 6.5% respectively [3].

A systematic review found that among studies that used multivariable analysis to adjust for patient-related confounders, the odds ratio for postoperative pulmonary complications attributable to COPD was 2.36 (CI 1.90-2.93) [12].

In the NSQIP observational study after adjusting for confounders, COPD was an independent predictor for postoperative failure to wean from the ventilator (OR 1.45, 95% CI 1.35-1.56), reintubation (OR 1.54, 95% CI 1.42-1.66), and pneumonia (OR 1.71, 95% CI 1.59-1.83).

Tae hoon Kim et al [5] done a retrospective cohort study in COPD patients undergoing abdominal surgery and found 16.3% developed postoperative pulmonary complications. The most common postoperative pulmonary complications were pneumonia (8.3%), atelectasis (4.9%) followed by pulmonary thromboembolism (0.5%) and acute exacerbation of COPD (0.3%).

Hyung-Jun Kim et al reported an incidence of 29 % in COPD patients undergoing elective abdominal surgery. [13]

In study done by Figen ATALAY et al. [6] 21.8 % of the COPD patients undergoing abdominal surgery developed postoperative pulmonary complications. The most common postoperative pulmonary complications were respiratory failure followed by pneumonia.

24% of the COPD patient developed postoperative pulmonary complications in a study done by Abraham Mathew et al [8] who underwent upper abdominal surgery. Hyung -Jun Kim et al found that 29% of the COPD patients undergoing abdominal surgery developed postoperative pulmonary complication [13].

Incidence of about 37% was reported in David H. Wong et al in which the subjects included were only severe COPD patients. [53]

Risk factors associated with postoperative pulmonary complication:

AGE:

A systematic review found that advanced age is an important independent predictor of postoperative pulmonary complications even after adjustment for co-morbid conditions using multivariable analysis. When compared with patients < 50 years old, patients aged 50 - 59 years, 60 - 69 years, 70 - 79 years, and ≥ 80 years had odds ratios (OR) of 1.5 (CI 1.31-1.71), 2.28 (CI 1.86-2.80), 3.90 (CI 2.70-5.65), and 5.63 (CI 4.63-6.85), respectively, of developing postoperative pulmonary complications. [12]

SMOKING:

Smoking has an adverse effect on respiratory epithelium and pulmonary function. So smoking increases the risk of developing postoperative pulmonary complications [14,15]. In a meta-analysis preoperative smoking was associated with an increased risk of postoperative pulmonary complications, (RR 1.73, 95% CI 1.35-2.23) [16]. Smokers with a greater than 20 pack-year smoking history have a higher incidence of postoperative pulmonary complications than those with a lesser pack-year history [17]. When patients discontinue smoking for atleast 8 weeks prior to surgery there is a statistically significant reduction in postoperative respiratory complications [18,19].

SYMPTOMS ASSESSMENT:

Hyung jun Kim et al found mMRC grading and CAT assessment scoring had no significance in developing postoperative pulmonary complications. [13]

A study of 269 COPD patients undergoing aortic arch replacement showed that patient's subjective dyspnoea was significantly related to postoperative respiratory complications. [20]

RISK ASSESSMENT:

Hyung jun Kim et al found that patients with ≥ 2 exacerbation or ≥ 1 exacerbation leading to hospital admission in the previous year had significant risk in development of postoperative pulmonary complications. [13]

Tae hoon Kim et al found more COPD patients developed postoperative pulmonary complications when they had history of hospitalization due to respiratory problem.[5]

RESPIRATORY INFECTION IN LAST MONTH:

Enhanced airway reactivity and increased airway resistance associated with viral infections may persist for weeks beyond resolution of symptoms [21,22]. Diaphragmatic function may be impaired during viral infections. History of an acute respiratory infection in the month preceding surgery is an independent risk factor for development of postoperative pulmonary complication [23]. So during an active or recent respiratory infection 2 - 4 weeks delay in elective surgery is advised.

METABOLIC AND NUTRITIONAL FACTORS:

Patients with BMI < 20 kg/m2, weight loss >10% over the previous 6 months, serum albumin < 3.5gm/L had increased incidence of postoperative pulmonary complications [24,25,26,27]

COPD patients were older and had significantly lower BMI. Lower BMI may be related to poor nutritional status in these patients. Many studies had shown that a low BMI is associated with a poor prognosis in patients with COPD independent of the degree of ventilatory impairment. Lower BMI often is associated with protein depletion, which in turn is associated with impairment of respiratory muscle strength, reduction in diaphragmatic muscular mass, and maximum voluntary ventilation, predisposing the patient to more pulmonary complications. [26,28,29,30]

PREOPERATIVE ANEMIA:

Jaume Canet et al [23] found that patients with preoperative anaemia (Haemoglobin <10 gm/dl1) had a three-fold increase in risk of developing postoperative pulmonary complication

GENERAL HEALTH STATUS:

Overall clinical status, as categorized by the American Society of Anaesthesiologists' (ASA) classification correlates well with development of postoperative pulmonary complications [33,55,56]. ASA class > II had 4.87 fold increase in risk of developing complication [12]

PREOPERATIVE OXYGEN SATURATION:

Canet et al [23] found that preoperative SpO2 ≤ 95% was an important independent predictor of risk. When compared with patients Spo2 ≥ 96%, patients Spo2 91–95 % and Spo2 ≤ 90% had odds ratio (OR) of 2.2 (CI 1.2–4.2) and 10.7 (4.1–28.1)

A observational validation study found that low preoperative SpO2 is strongly associated with risk for developing postoperative respiratory failure. So routine measurement of preoperative SpO2 should be encouraged and that it will probably prove to be a robust predictor of poor postoperative outcome

PULMONARY FUNCTION TESTS

Indications for preoperative pulmonary function testing include unexplained dyspnoea, presence of cough, reduced exercise tolerance, cigarette smoking >20 years, chronic obstructive pulmonary disease [COPD], interstitial lung disease

Fuso L et al found that preoperative FEV1 < 60 % of predicted is a risk factor for developing postoperative pulmonary complications [31]

In a study of patients with severe COPD (FEV_1 <50 percent predicted), preoperative PFTs did not predict the risk of pulmonary complications, [32].

A review of preoperative PFT evaluated 14 studies and found spirometric values were significant risk predictors in three of four studies that used multivariable analysis. However, other factors conferred higher odds ratios for pulmonary complications than did abnormal spirometry in two of these studies [33,34]

Brooks Brunn et al done a study in patients undergoing abdominal surgery and found there was no difference in FVC, FEV_1, or FEV_1/FVC between patients who had a pulmonary complication and those who did not [35]

Warner DO et al matched smokers with FEV_1 of < 40 % of predicted to smokers with a normal FEV_1 [36]. The incidence of postoperative pulmonary complications was not significantly different between the two groups.

Hyung-Jun Kim et al [13] found that severe airflow limitation leads to increased risk of postoperative pulmonary complications after upper abdominal surgery.

ANAESTHESIA:

Effect of general anaesthesia on the lung includes: [36,37,38]

- Instrumentation causes mucociliary function alterations and promoting retention of secretions.
- Drugs administered causes release of circulating mediators leading to bronchoconstriction
- Decreased surfactant production
- Inhibition of alveolar macrophage activity.

General anaesthesia causes 20% decrease in FRC which leads to atelectasis and impaired gas exchange significantly.

In a study of 2644 COPD patients who underwent surgery , prolonged ventilator dependence (2.1% vs 0.9%), rates of pneumonia (3.3% vs 2.3%), and unplanned postoperative intubation (2.6% vs 1.8%) were all more common among patients received general anaesthesia than among those received regional anaesthesia [40] .

A systematic review evaluated the results of 141 trials [41] and found patients received neuraxial blockade had 59% decrease in the risk of respiratory depression and 39% reduction in the risk of pneumonia compared to patients received general anaesthesia.

COPD patients undergoing surgery under regional anaesthesia is associated with lower incidence of postoperative pulmonary complications.

DURATION OF SURGERY:

Incidence of postoperative pulmonary complication is high when the duration of surgical procedure is greater than 3 hrs [5,23,42]. When duration of surgery is greater than 2.5 hrs there is 2.26 times odds of getting pulmonary complication.

SURGICAL SITE:

Incidence of postoperative complications is inversely related to the distance of the surgical incision from the diaphragm. Thus, the complication rate is significantly higher for thoracic and upper abdominal surgery than for lower abdominal [35, 43].

In a systematic review postoperative pulmonary complication for upper abdominal surgery and lower abdominal surgery were 19.7 % and 7.7 % respectively [12].

Abdominal aortic aneurysm repair is also associated with a high risk of postoperative pulmonary complications [24]. Laparoscopic cholecystectomy, when compared with open cholecystectomy, demonstrates better preservation and faster recovery of lung volumes, higher arterial oxygen saturations, less postoperative pain and analgesia use, and a lower incidence of postoperative pulmonary complications. [44,45,46]

INTRAOPERATIVE BLOOD TRANSFUSION:

A study of COPD patients undergoing abdominal surgery showed that estimated blood loss was a risk factor in PPCs [47]. RBC transfusions > 2 units was an independent predictor of postoperative pulmonary complications.

Olubukola O et al found that when intra-operative blood transfusion was greater than 2 units it is significantly associated with a 1.8 times higher risks of unplanned intubation .[48]

Ahsan M. Arozullah et al [24] found that after adjusting for confounders, intraoperative blood transfusion of greater than 4 units was an independent predictor for postoperative pneumonia (OR 1.35, 95% CI 1.07-1.72)

POSTOPERATIVE MORBIDITY AND MORTALITY:

Postoperative pulmonary complications were the most costly of major postoperative medical complications and resulted in the longest length of hospital and ICU stay [3]. Median length of stay was 4 days for patients with COPD vs 1 day in those without COPD. Mortality was 6.7% in COPD patients vs 1.2% for patients without COPD [3,4].

RISK INDEX:

Canet et al [23] developed the ARISCAT (The Assess Respiratory Risk in Surgical Patients in Catalonia) Risk Index which predicts the overall incidence of postoperative pulmonary complications, by assigning a weighted point score to seven independent risk factors.

The incidence of pulmonary complications in patients with scores stratified as low, intermediate, and high-risk is 1.6, 13.3, and 42.2 %, respectively.

Valentín Mazo et al [49] done an external validation of ARISCAT risk index in a large European cohort and found that ARISCAT risk index predicts three levels of postoperative pulmonary complications risk in hospitals outside the development setting.

Elif Kupeli et al found that ASA classification was found to be a weaker modality to predict postoperative pulmonary complications after renal transplant than the ARISCAT risk index.[50]

Gupta risk index and Arozullah respiratory failure index is too complicated for use in clinical practice and is not possible to perform this calculation manually.

AIMS AND OBJECTIVES

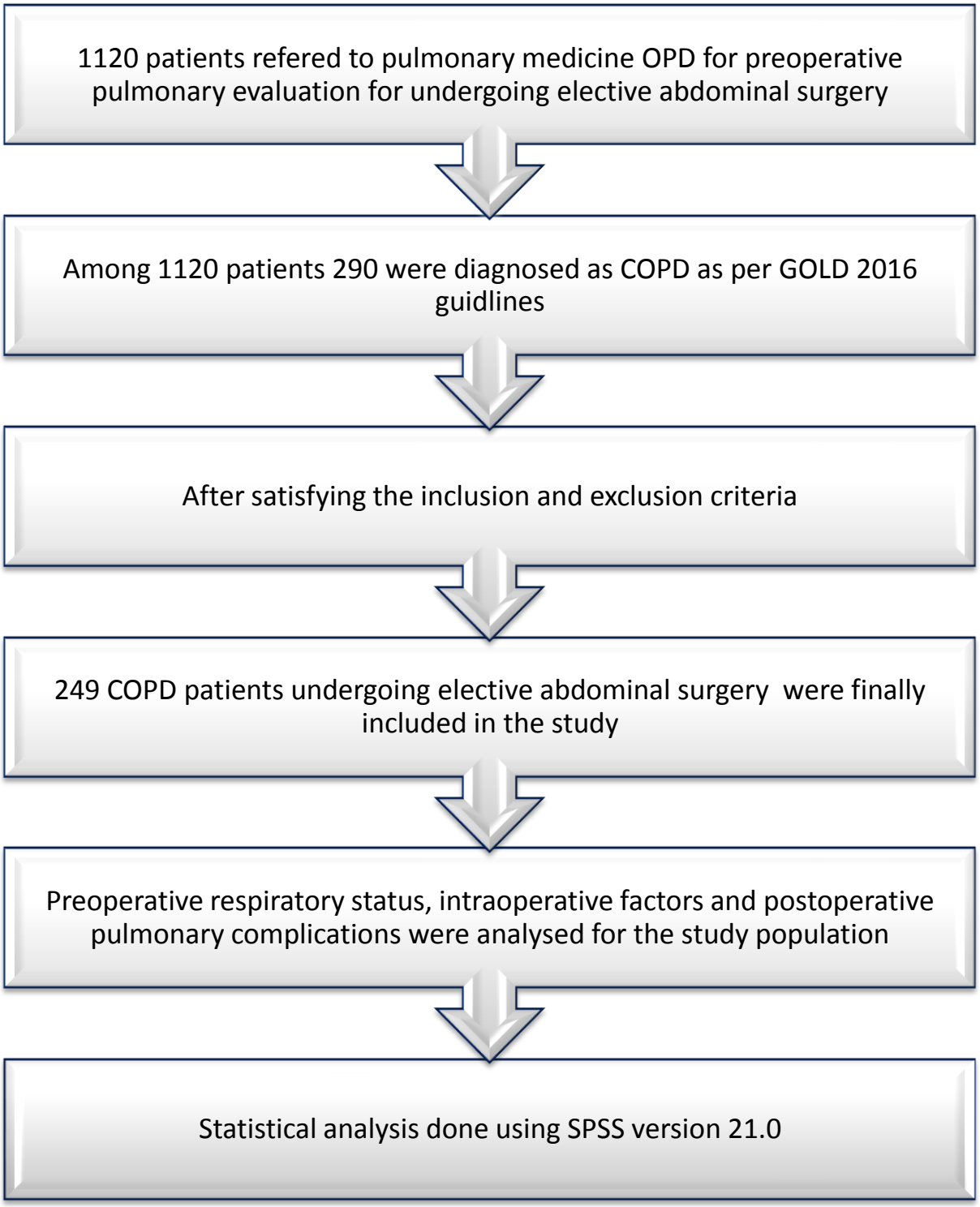
PRIMARY OBJECTIVE:

To analyze the preoperative respiratory status and postoperative pulmonary complications of chronic obstructive pulmonary disease patients undergoing abdominal surgery in a tertiary care hospital.

SECONDARY OBJECTIVES:

1. To determine the association between potential risk factors and postoperative pulmonary complication among COPD patients undergoing abdominal surgery
2. To assess the efficacy of ARISCAT risk index in predicting the postoperative pulmonary complications in COPD patients undergoing abdominal surgery.

ALGORITHM SHOWING SAMPLING METHOD ADOPTED



MATERIALS AND METHODS

STUDY DESIGN:

- The study was a cross sectional observational study.
- Consecutive COPD patients who underwent elective abdominal surgery were included in the study
- No specific method of randomisation was used.
- No controls were used in the study
- No specific intervention was done.

STUDY PERIOD:

14 months from April 2016 to June 2017

STUDY CENTRE:

The study was conducted in Rajiv Gandhi Government General Hospital, Park Town , Chennai, which is a tertiary care institute.

SUBJECT SELECTION :

Inclusion criteria:

- Patients undergoing elective abdominal surgery
- Spirometric diagnosis of COPD according to GOLD 2016 guidelines with post bronchodilator FEV1/FVC under 0.70
- Patients willing to participate in the study and give informed consent

Exclusion criteria:

- Patients undergoing emergency surgery
- Patients with presence of active pulmonary tuberculosis and past history of tuberculosis
- Patients with preexisting tracheostomies
- Restrictive lung disease
- Obstructive sleep apnea
- Severe renal and liver disease
- Cardiac disease (LV dysfunction, CAD)
- Patients not willing to give informed written consent

SAMPLE SIZE:

249 patients who underwent elective abdominal surgery at Rajiv Gandhi Government General Hospital who satisfied the inclusion and exclusion criteria were enrolled in the study.

Informed consent was obtained after explaining the nature of the study.

DATA COLLECTION:

The following were assessed in our study in patients with Chronic Obstructive Pulmonary Disease undergoing elective abdominal surgery

- Preoperative evaluation
- Intraoperative evaluation
- Postoperative evaluation

Preoperative assessment:

The following data were collected from the patient:

- Name
- Age
- Sex
- Occupation

Detailed clinical history was collected which included

- History of cough, sputum production, and wheeze their duration taken.
- History respiratory tract infections in the past month
- Previous history of exacerbations and hospitalization in the past 1 year (exacerbations when patient needed to attend a health care unit because of symptoms which lead to increase in dose or addition of an antibiotic)
- Previous history of co-morbid illness like diabetes mellitus, hypertension.
- Smoking history
- History of exposure to biomass and noxious stimulus

Severity of symptoms:

Severity of symptoms as perceived by the patient was measured using Modified Medical Research Council grades (mMRC)

Modified Medical Research Council grades (mMRC) :

We used the modified medical research council scale of dyspnoea to assess the severity of dyspnoea. It quantifies the disability associated with breathlessness by identifying when breathlessness occurs (Grades 0 and 1) or by quantifying the associated exercise impairment (Grades 2–4) The mMRC grades were self-administered asking patients to choose the description that best suited their condition

Table 1: Modified Medical Research Council Grades

Grade	**Description**
0	I only get breathless with strenuous exercise
1	I get short of breath when hurrying on the level or walking up a slight hill
2	I walk slower than people of the same age on the level because of breathlessness or have to stop for breath when walking at my own pace on the level
3	I stop for breath after walking about 100 yards or after a few minutes on the level
4	I am too breathless to leave the house or I am breathless when dressing

SMOKING STATUS:

Smoking status of the patient was recorded using CDC guidelines definition: [51]

Current smoker - who has smoked greater than 100 cigarettes in lifetime and now smokes every day or some days

Former smoker - who has smoked greater than 100 cigarettes in their lifetime and does not currently smoke

Never smoker - who has not smoked greater than 100 cigarettes in their lifetime.

Number of pack-years was calculated by the following formula:

Number of pack-years = (number of *cigarettes*/ bidi smoked per day/20) × number of years smoked [14].

Body Mass Index:

Body Mass Index (BMI) was calculated from the height and weight of the patient using the formula

$BMI = \text{Weight in kg} / (\text{Height in m})^2$

The patients were classified based on the BMI as given in Table as per WHO recommendations

Table 2: Interpretation of nutritional status of patients using BMI

BMI	NUTRITIONAL STATUS
< 18.5 (Under weight)	Underweight
18.5 - 24.9 (normal)	Normal
25 - 29.9 (over weight)	Overweight
≥ 30 (obese)	Obese

General health status: [54]

●**ASA 1:** Healthy.

●**ASA 2:** Mild systemic disease (GOLD stage 2, well-controlled hypertension, stable asthma, diabetes mellitus).

●**ASA 3:** Severe systemic disease (GOLD stage 3, History of angina, poorly controlled hypertension, morbid obesity).

●**ASA 4:** Severe systemic disease with a constant threat to life (GOLD stage 4, history of unstable angina, uncontrolled diabetes or hypertension, advanced renal, pulmonary, or hepatic dysfunction).

●**ASA 5:** Moribund patient not expected to survive without operation (Ruptured aortic aneurysm).

●**ASA 6:** A declared brain-dead patient whose organs are being removed for donor purposes.

Routine investigations including:

1. Chest X ray PA view

2. Preoperative Haemoglobin

3. Random Blood Sugar

4. Electrocardiogram

5. Echocardiogram

6. Sputum AFB if necessary

Pulmonary Function Test:

Pulmonary function test was done for all patients who satisfied the inclusion criteria. The test was performed in accordance with the criteria set by the American Thoracic Society using Easyone Spirometer. The instrument was calibrated daily. The procedure was explained to all patients before the test. Any recent history of smoking, illness, medication were enquired and the height and weight were recorded. All participants were kept in the seated position for the procedure.

All participants were instructed and demonstrated to hold the head in slightly elevated manner, position the mouthpiece and close lips, inhale completely and rapidly and then exhale maximally until no more air can be expelled.

Instructions were repeated as necessary. Throughout the manoeuvre, subjects were encouraged to blast out and exhale using appropriate body languages and phrases. The test was stopped whenever they complained of distress or dizziness. The test was

repeated till at least three trials with two acceptable and reproducible tests for both FEV1 and FVC were obtained. Measurements were made before and after at least 15 minutes of two puffs of salbutamol (200 microgram) administered using metered dose inhaler with a volumetric spacer. The degree of airflow obstruction was assessed as per GOLD guidelines. (Fig 11)

Table 3: Severity of airflow limitation as per GOLD guidelines [1]

Classification of Severity of Airflow Limitation in COPD (Based on Post – Bronchodilator FEV_1)		
GOLD 1	Mild	$FEV_1 \geq 80\%$ predicted
GOLD 2	Moderate	$50\% \leq FEV_1 < 80\%$ predicted
GOLD 3	Severe	$30\% \leq FEV_1 < 50\%$ predicted
GOLD 4	Very severe	$FEV_1 < 30\%$ predicted

Intraoperative evaluation:

- Type of anaesthesia – general anaesthesia or neuraxial blockade
- Duration of surgery
- Mode of surgery – Laparoscopy or laparotomy (open surgery)
- Site of surgical incision – upper or lower abdominal incision
- Intraoperative blood transfusion and number of units transfused
- Intraoperative complication.

Postoperative evaluation:

Development of postoperative pulmonary complications were observed till the patient got discharged from the hospital.

Postoperative pulmonary complications is defined as pulmonary abnormality that produces identifiable dysfunction or disease postoperatively that is significant clinically and adversely affects the clinical course [9]

The various possible PPC considered were as

- Pneumonia
- Atelectasis
- Respiratory failure
- Pleural effusion
- Exacerbation of COPD
- Pulmonary Embolism

Pneumonia:

European Perioperative Clinical Outcome (EPCO) [52] definition for Pneumonia is chest radiography with at least one of the following: consolidation, infiltrate, cavitation ; plus at least one of the following:, white cell count < 4000 or > 12000, fever >38°C with no other cause , positive blood cultures, isolation of pathogen from sputum plus atleast two of the following: new/worse cough/ tachypnoea /dyspnoea , new purulent/ changed sputum, increased secretions/ suctioning, crackles/bronchial breath sounds.

Atelectasis:

Lung opacification with mediastinal shift, hilum or hemidiaphragm shift towards the affected area, with compensatory hyperinflation in adjacent non-atelectatic lung.

Respiratory failure:

Need for postoperative mechanical ventilation >48 h, Re-intubation within 3 days requiring mechanical ventilation . Postoperative PaO2 < 60 mm Hg on room air, a PaO2:FIO2 ratio < 300 mm Hg , or Spo2 <90% and requiring oxygen therapy

Pleural effusion:

Chest radiography with blunting of costophrenic angle, loss of sharp silhouette of the ipsilateral hemidiaphragm in upright position,, or (in supine position) hazy opacity in one hemithorax with preserved vascular shadows.

Exacerbation of COPD:

Defined as an acute worsening of respiratory symptoms that result in additional therapy.

Pulmonary embolism:

Diagnosed using elevated d – Dimer , echocardiographic finding of right ventricle and right atrial dysfunction and CT pulmonary angiography.

Duration of ICU and Post surgery hospital stay was calculated

RISK INDEX:

ARISCAT RISK INDEX is a tool for assessment of postoperative pulmonary risk. It was used to predict the overall incidence of postoperative pulmonary complications (of any severity), by assigning a weighted point score to 7 independent risk factors

Table 4: ARISCAT RISK INDEX [23]

RISK FACTOR	SCORE
Age in yrs	
≤ 50	0
51–80	3
> 80	16
Preoperative SpO2	
≥ 96 %	0
91% – 95%	8
≤ 90	24
Respiratory infection in the last month	17
Preoperative anemia (≤ 10 g/dl)	11
Surgical incision	
Peripheral	0
Upper abdominal	15
Intrathoracic	24
Duration of surgery in hrs	
≤ 2	0
>2 to 3	16
>3	23
Emergency procedure	8

Minimum score – 0

Maximum score – 123.

ARISCAT Risk Index: Independent Predictors of Postoperative Pulmonary Complications	
Risk class	No. of points in risk score
Low	< 26 points
Moderate	26 – 44 points
High	≥ 45 points

STATISTICAL ANALYSIS: The data collected was entered in to Microsoft (MS) excel worksheet and analyzed using Statistical Package for Social Sciences (SPSS) software version 21.0. Results were subjected for appropriate statistical analysis. Significance of correlation between variables was assessed using P value. A correlation was considered to be statistically significant if its P value was less than 0.05.

RESULTS

PATIENT CHARACTERISTICS:

A total number of 249 COPD patients undergoing abdominal surgery were included in the study after satisfying the inclusion and exclusion criteria.

AGE DISTRIBUTION:

The mean age of the study population was 56.63 with a standard deviation of 8.074. The number of patients in the age groups 41-49, 50-59, ≥ 60 were 61 (24.5%), 109 (43.8%), 79 (31.7%)

Table 5: *Age distribution*

AGE RANGE	FREQ	%
40 - 49 years	61	24.5%
50 - 59 years	109	43.8%
≥ 60 years	79	31.7%

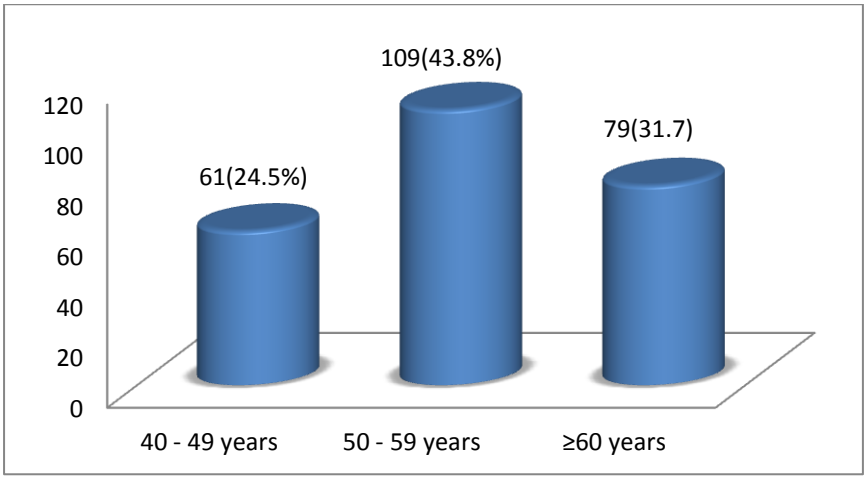


Fig 1*: AGE DISTRIBUTION*

GENDER DISTRIBUTION:

Out of 249 patients included in study 194 were male and 55 were females.

Table 6: *Gender distribution*

	FREQ	%
MALE	194	77.9%
FEMALE	55	22.1%
TOTAL	249	100%

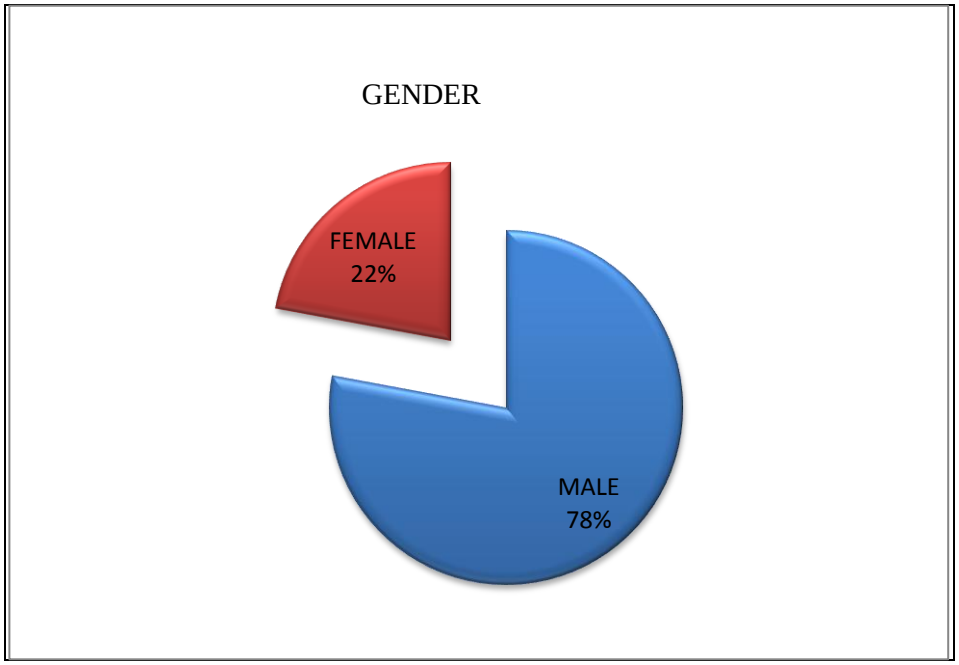


Fig 2: *Gender distribution*

mMRC GRADING OF DYSPNEA :

The severity of symptoms such as breathlessness was assessed based on mMRC grading of dyspnea. Of the 249 patients, no one reported grade 4, while the majority had grade 2 or 3 of mMRC of dyspnea. The percentage of patients with grade 0, 1, 2, 3 and 4 are 7.6%, 45.8%, 36.9% and 9.6% respectively.

Table 7: *mMRC grading of dyspnea*

mMRC grade	FREQ	%
0	19	7.6%
1	114	45.8%
2	92	36.9%
3	24	9.6%
4	0	0
Total	249	100.0%

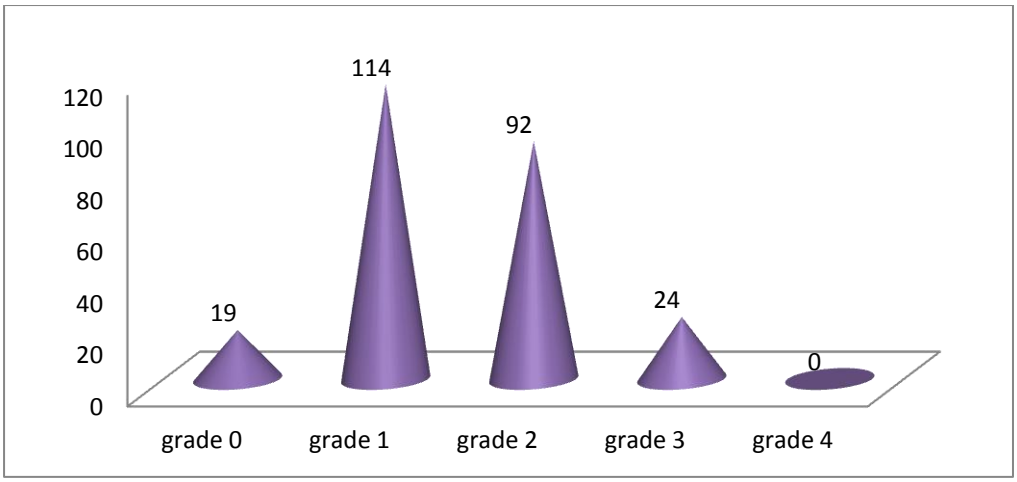


Fig 3: *mMRC dyspnea grading*

EXACERBATIONS AND HOSPITALISATION IN THE STUDY POPULATION:

In our study population 91 of them reported exacerbations in the last one year and 39 of them also had history of hospitalisation in the last one year. Of the 91 patients, 39 (15.7%) of them had more than one episode of exacerbation. We can see that 39 (15.7%) of the patients are in the high risk category based on hospitalisation and frequency of exacerbations.

Table 8: *Distribution of patients by exacerbations*

No.of Exacerbation	FREQ	%
0	156	63.5%
1	52	20.9%
2	39	15.7%
Total	249	100%

Table 9: *Hospitalisation status*

No.of Hospitalisation	FREQ	%
0	210	84.3%
≥ 1	39	15.7%
Total	249	100%

RESPIRATORY INFECTION IN LAST MONTH:

Out of 249 patients included in study 58 had history of respiratory tract infection in the previous month.

Table 10: *Distribution of patients with respiratory infection in last month*

H/O respiratory infection in last month	FREQ	%
YES	58	23.3%
NO	191	76.7%
Total	249	100%

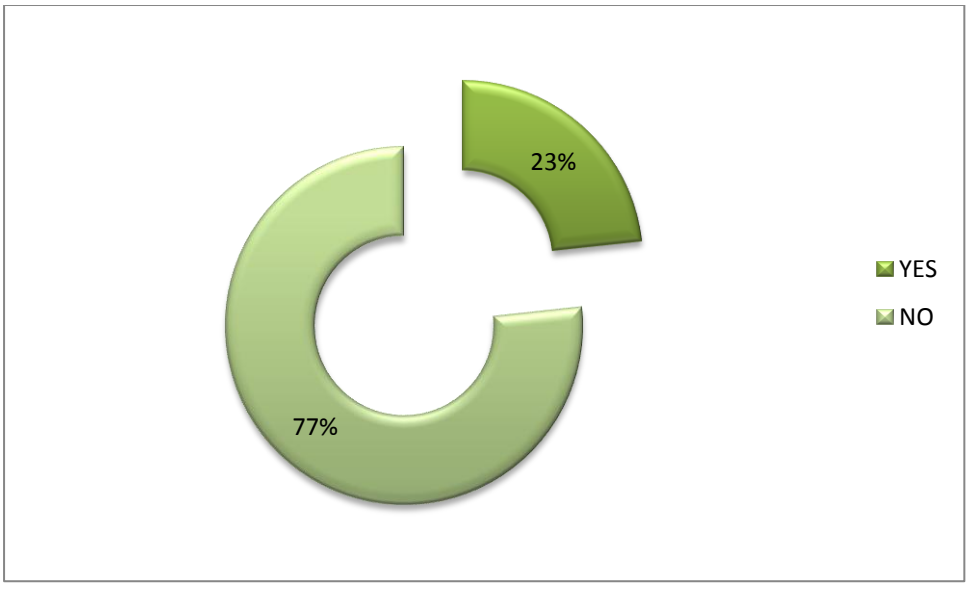


Fig 4: *Distribution of patients with respiratory infection in last month*

DEGREE OF AIRFLOW LIMITATION IN STUDY POPULATION:

Airflow limitation assessed based on post bronchodilator FEV1% predicted as in GOLD guidelines. In our study population 16 patients was in the mild category (> 80% predicted). 5 of them were in the very severe category (< 30% predicted), 53 were in the severe airflow limitation category (30 to 50% predicted) and majority i.e., 175 were found to have moderate degree of airflow limitation (50 to 80% predicted).

Table 11: *Degree of airflow limitation*

Degree of airflow limitation	FREQ	%
Mild	16	6.4%
Moderate	175	70.3%
Severe	53	21.3%
Very severe	5	2%
Total	249	100%

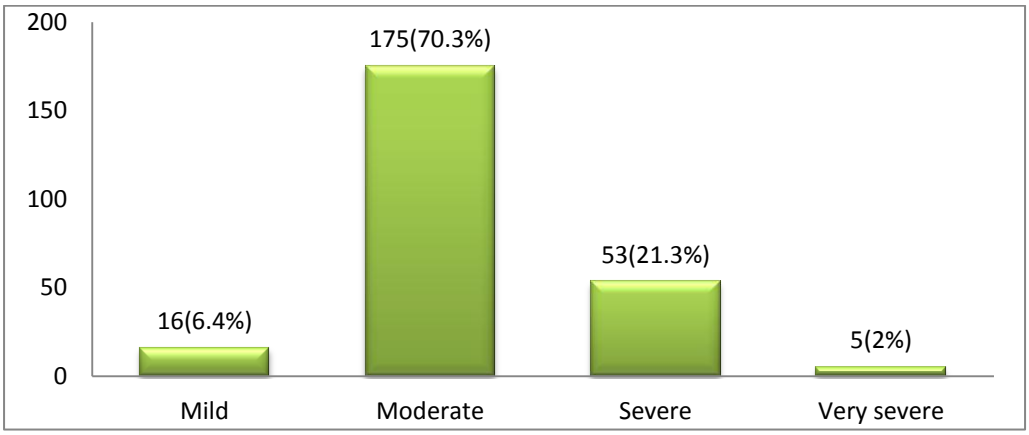


Fig 5: *Distribution of patients by airflow limitations (FEV1)*

BODY MASS INDEX OF THE POPULATION:

The body mass index of the study population was calculated by measuring the height, weight and using the Quetlet index. In the study population 182 of them were in the normal healthy BMI range and only 8 of them were in the obese range. 14 were underweight range in our study

Table 12: *BMI distribution*

	FREQ	%
< 18.5 (Under weight)	14	5.6%
18.5 - 24.9 (normal)	182	73.1%
25 - 29.9 (over weight)	45	18.1%
≥ 30 (obese)	8	3.2%

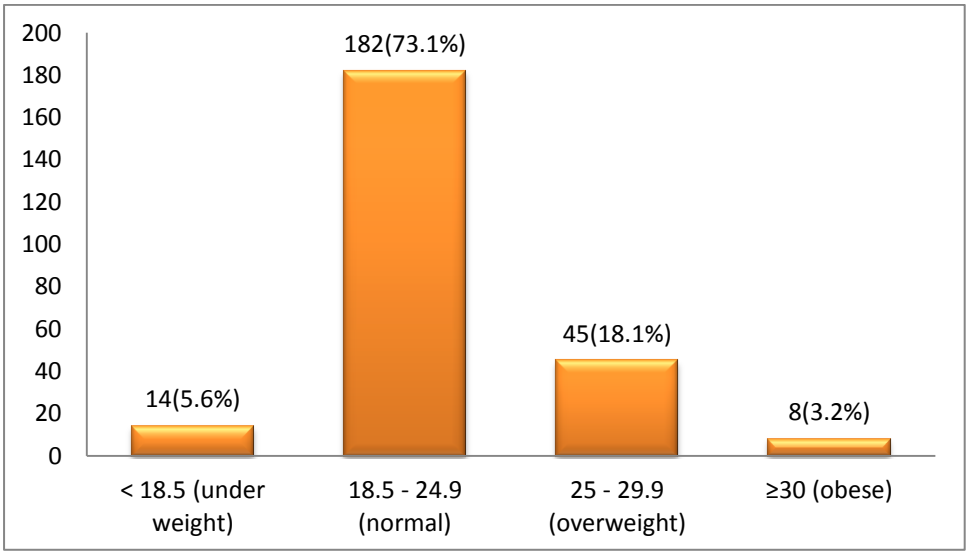


Fig 6: D*istribution of patients by body mass index using quetlet index*

SMOKING STATUS

Out of 249 patients included in the study 123 were former smoker, 56 were current smokers and 70 patients were never smoker.

Table 13: *Distribution of patients by smoking status*

SMOKING STATUS	FREQ	%
Current Smoker	56	22.5%
Former Smoker	123	49.4%
Never Smoker	70	28.1%
Total	249	100%

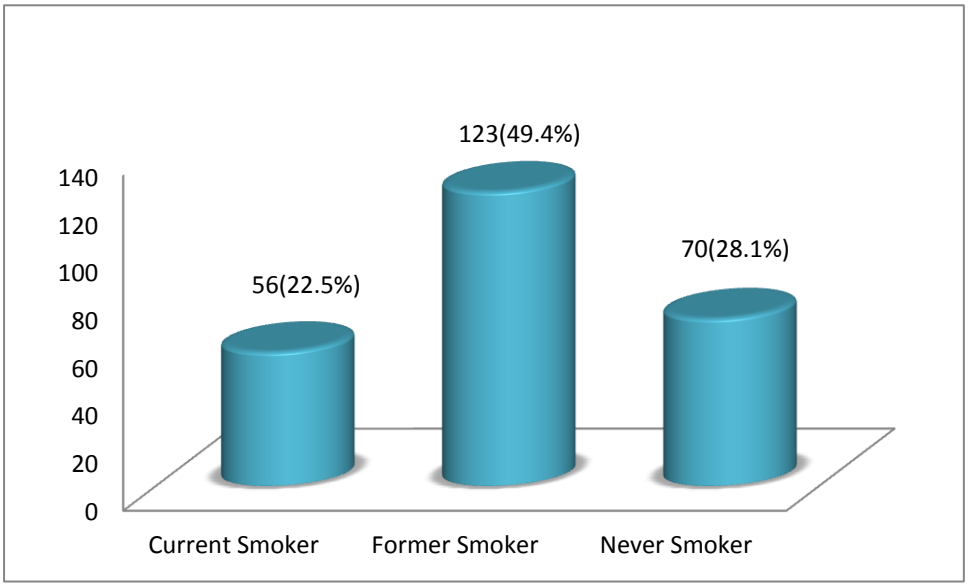


Fig 7: *Distribution of patients by smoking status*

PACK YEARS

The pack year of the study population was calculated by:

Number of pack years = packs smoked per day × number of years smoked.

In the study population 25 had ≥ 40 pack years and majority that is 84 had (1- 20) pack years.

Table 14: D*istribution of patients by pack years*

PACK YEARS	FREQ	%
< 1	73	29.3%
1 - 20	84	33.7%
21 - 39	67	26.9%
≥ 40	25	10%
Total	249	100%

GENERAL HEALTH STATUS:

General health status of the patients were assessed using American Society of Anaesthesiologist (ASA) classification. In our study population 8 patients was in ASA class 1. 5 of them were in ASA class 4, 52 were in ASA class 3 and majority i.e., 184 were in ASA class 2. No patients were in ASA 5 and ASA 6 class.

Table 15: *Distribution of patients by ASA classification*

ASA Class	FREQ	%
1	8	3.2%
2	184	73.9%
3	52	20.9%
4	5	2%
Total	249	100%

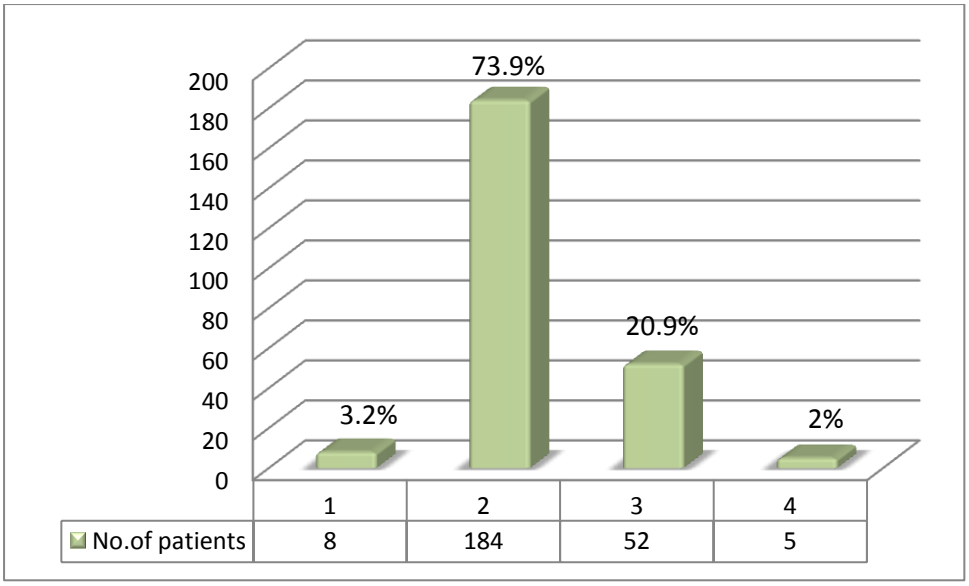


Fig 8: *Distribution of patients by ASA classification*

DIABETES AND SYSTEMIC HYPERTENSION:

In our study group 28 (11.2%) had diabetes and 23 (9.2 %) had systemic hypertension. In this group, 10 patients had both diabetes and hypertension

Table 16: *Distribution of patients by diabetes mellitus*

DM	FREQ	%
YES	28	11.2%
NO	221	88.8%
TOTAL	249	100%

Table 17: *Distribution of patients by systemic hypertension*

SHT	FREQ	%
YES	23	9.2%
NO	226	90.8%
TOTAL	249	100%

PREOPERATIVE HAEMOGLOBIN STATUS:

In our study population 31 patients were anaemic their haemoglobin was ≤ 10 gm/dl and 218 patients had haemoglobin > 10 gm/dl

Table 18: *Distribution of patients by haemoglobin status*

	FREQ	%
≤ 10 gm/dl	31	12.4%
> 10 gm/dl	218	87.6%
Total	249	100%

PREOPERATIVE OXYGEN SATURATION:

Preoperatively oxygen saturation (Spo2) was recorded using pulse oximetry. In our study population 10 patients had oxygen saturation between 91 – 95% and 239 patients had oxygen saturation ≥ 96%, no patients had saturation below 91%.

Table 19: *Distribution patients by oxygen saturation*

	FREQ	%
≥ 96%	239	96%
91 - 95%	10	4%
Total	249	100%

INTAOPERATIVE PARAMETERS:

MODE OF SURGERY: Among the study population 61 (24.5%) patients underwent laparoscopic abdominal surgery and 188 patients underwent laparotomy.

TYPE OF ANAESTHESIA: 130 (52.2%) patients underwent surgery under general anaesthesia and 119 patients underwent surgery under neuraxial blockade.

SITE OF SURGICAL INCISION: 136 (54.6%) patients had upper abdominal surgical site incision and 113 patients had lower abdominal surgical site incision.

Table 20: *Distribution of patients based on intraoperative parameters*

		FREQ	%
MODE OF SURGERY	Laparotomy	188	75.5%
	Laparoscopy	61	24.5%
TYPE OF ANAESTHESIA	General Anaesthesia	130	52.2%
	Neuraxial blockade	119	47.8%
SURGICAL INCISION SITE	Upper	136	54.6%
	Lower	113	45.4%

DURATION OF SURGERY:

98 patients had duration of surgery less than 2 hours, 81 patients had duration of surgery between 2 to 3 hours and 70 (28.1%) patients had duration of surgery greater than 3 hours

Table 21: *Distribution of patients based on duration of surgery*

DURATION OF SURGERY	FREQ	%
< 2 hrs	98	39.4%
2 – 3 hrs	81	32.5%
> 3 hrs	70	28.1%
Total	249	100%

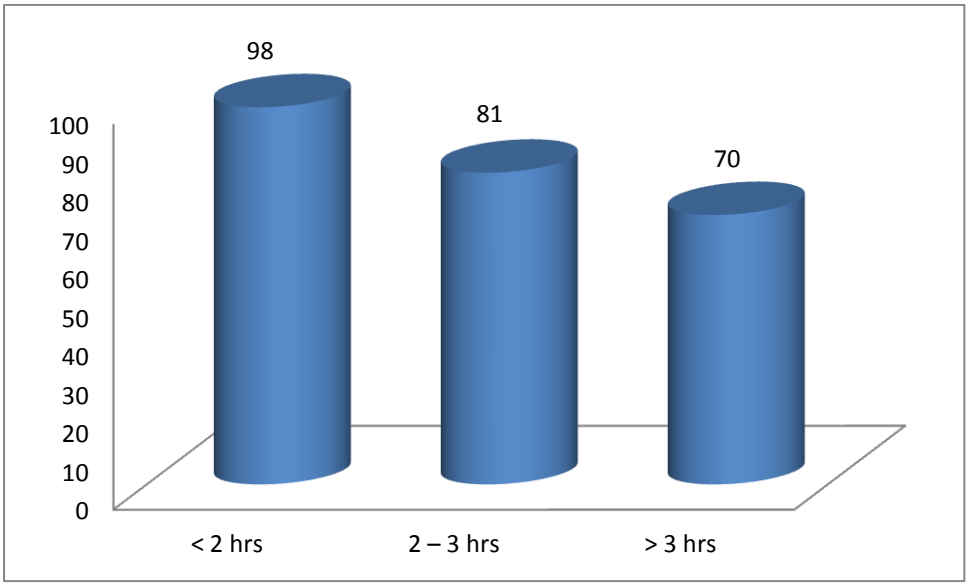


Fig 9: *Distribution of patients based on duration of surgery*

POSTOPERATIVE PULMONARY COMPLICATIONS:

Out of 249 COPD patients who underwent elective abdominal surgery 58 (23%) developed postoperative pulmonary complications and 192 patients had no postoperative pulmonary complications.

Table 22: *Distribution of patients based on development of postoperative pulmonary complications*

Postoperative pulmonary complications	FREQ	%
YES	57	23%
NO	192	77%
Total	249	100%

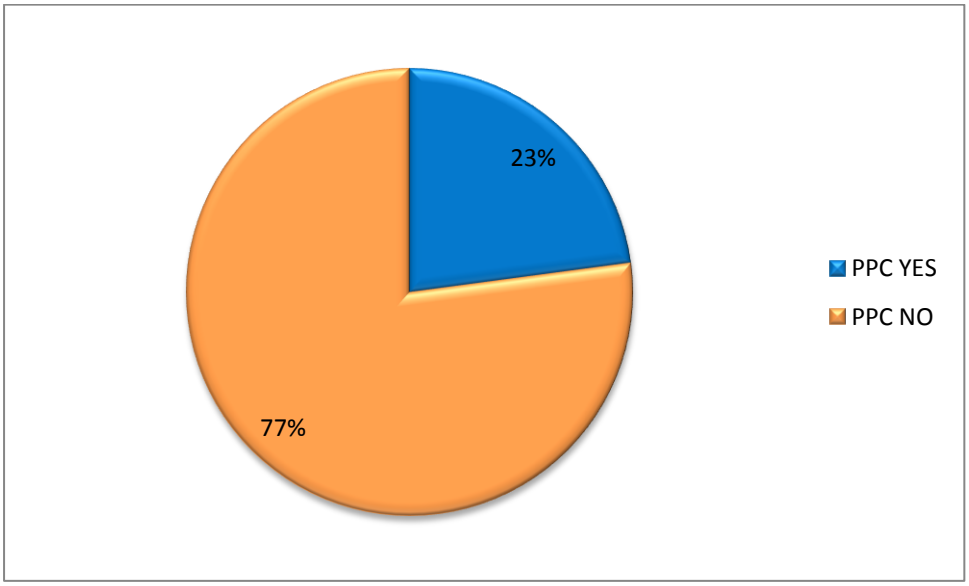


Fig 10: *Distribution of patients based on development of postoperative pulmonary complications*

TYPE OF POSTOPERATIVE PULMONARY COMPLICATIONS:

Out of 57 patients who developed postoperative pulmonary complications 29 had respiratory failure (which includes 21 patients on mechanical ventilation for > 48hrs and 8 patients had unplanned intubation), 22 had pneumonia or atelectasis, 3 had pleural effusion, 8 had exacerbation of COPD, 1 developed pulmonary embolism and 3 patients died. 45% of the patients had more than one complications. 21% had both respiratory failure and pneumonia.

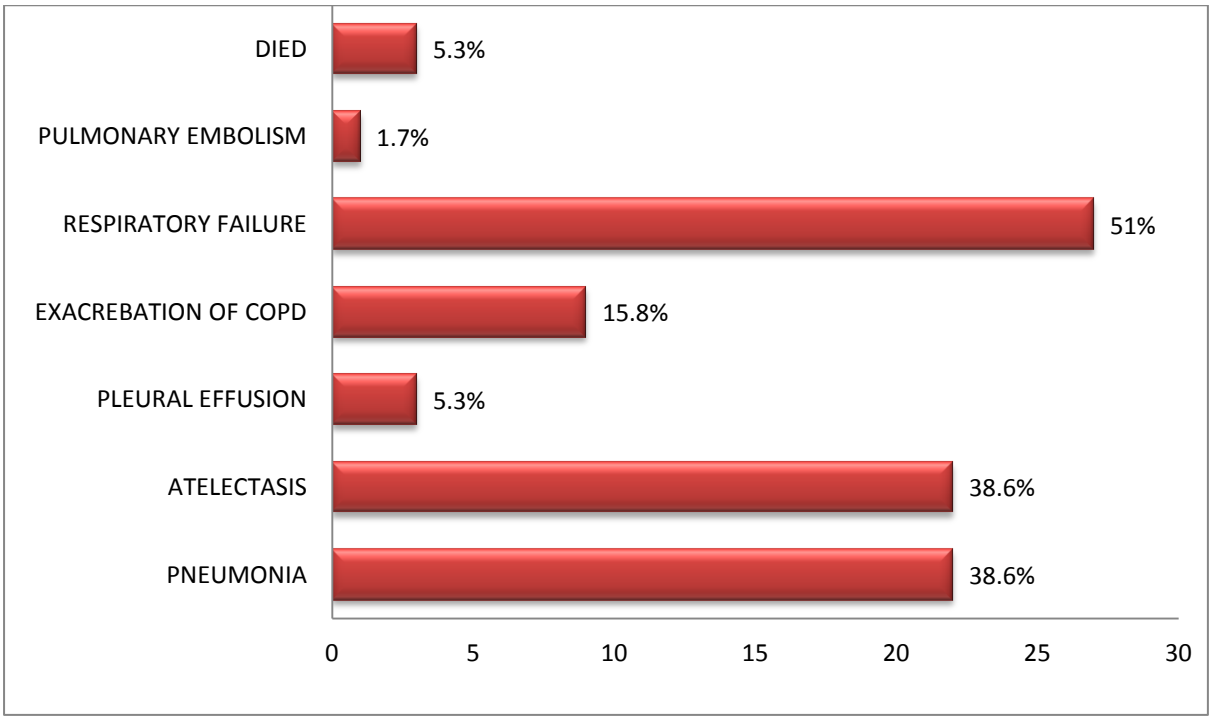


Fig 11: *Type of postoperative pulmonary complications*

ARISCAT RISK INDEX:

ARISCAT risk index was calculated by assigning a weighted point score to 7 independent risk factors. According to the calculated ARISCAT score in the study population 31% (77) had low risk, 62% had moderate risk and 7% (18) had high risk of developing postoperative pulmonary complication.

Table 23: *Distribution of patients based on ARISCAT risk index*

ARISCAT risk index	FREQ	%
LOW	77	31%
MODERATE	154	62%
HIGH	18	7%
Total	249	100%

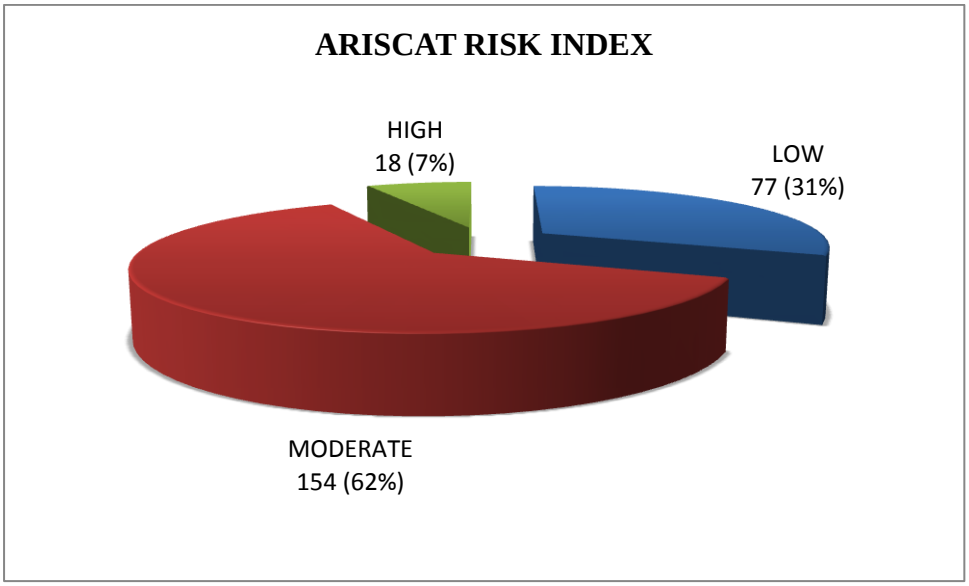


Fig 12 : *Distribution of patients based on ARISCAT risk index*

Table 25: Association of various factors with development of postoperative pulmonary complications

		POSTOP PULMONARY COMPLICATION				Chi sq p values
		YES		NO		
		Freq	%	Freq	%	
AGE RANGE	40 - 49 yrs	14	23.0%	47	77.0%	0.039
	50 - 59 yrs	18	16.5%	91	83.5%	
	≥ 60 yrs	24	33.8%	47	66.2%	
GENDER	MALE	46	23.7%	148	76.3%	0.563
	FEMALE	11	20.0%	44	80.0%	
mMRC GRADING	0	1	5.3%	18	94.7%	< 0.001
	1	17	14.9%	97	85.1%	
	2	29	31.5%	63	68.5%	
	3	10	41.7%	14	58.3%	
FEV1 RANGE	≥ 80%	1	6.3%	15	93.8%	< 0.001
	79 - 50%	31	17.7%	144	82.3%	
	49 - 30%	23	43.4%	30	56.6%	
	< 30 %	2	40.0%	3	60.0%	
NO OF HOSPITALIZATION	0	29	13.8%	181	86.2%	< 0.001
	1.0	26	70.3%	11	29.7%	
	2.0	2	100.0%	0	0.0%	
BMI RANGE	< 18.5	4	28.6%	10	71.4%	0.104
	18.5 - 24.9	42	23.1%	140	76.9%	
	25 - 29.9	7	15.6%	38	84.4%	
	≥ 30	4	50.0%	4	50.0%	
SMOKING STATUS	Current Smoker	22	39.3%	34	60.7%	0.003
	Former Smoker	24	19.5%	99	80.5%	
	Never Smoker	11	15.7%	59	84.3%	

PACK YEARS	< 1	11	15.1%	62	84.9%	< 0.001
	1 - 20	11	13.1%	73	86.9%	
	21 - 39	23	34.3%	44	65.7%	
	≥ 40	12	48.0%	13	52.0%	
DM	YES	5	27.8%	13	72.2%	0.19
	NO	52	22.5%	179	77.5%	
SHT	YES	1	7.7%	12	92.3%	0.127
	NO	56	23.7%	180	76.3%	
Spo2	≥ 96%	52	21.8%	187	78.2%	0.041
	91 - 95%	5	50.0%	5	50.0%	
	≤ 90%	0	0.0%	0	0.0%	
Hb	≤ 10	5	16.1%	26	83.9%	0.338
	> 10	52	23.9%	166	76.1%	
ASA	1	0	0.0%	8	100.0%	< 0.001
	2	32	17.4%	152	82.6%	
	3	23	44.2%	29	55.8%	
	4	2	40.0%	3	60.0%	
MODE OF SURGERY	Open	53	28.2%	135	71.8%	< 0.001
	Lap	4	6.6%	57	93.4%	
TYPE OF ANAESTHESIA	GA	44	33.8%	86	66.2%	< 0.001
	Regional	13	10.9%	106	89.1%	
SURGICAL INCISION SITE	Upper	47	34.6%	89	65.4%	< 0.001
	Lower	10	8.8%	103	91.2%	
DURATION OF SURGERY	< 2	13	13.3%	85	86.7%	< 0.001
	2 – 3	6	7.4%	75	92.6%	
	> 3	38	54.3%	32	45.7%	

Risk factors associated with postoperative pulmonary complication:

Table 26: Age and postoperative pulmonary complications

AGE RANGE	POST OP PULMONARY COMPLICATION		Total	p value
	YES	NO		
41 - 49 years	14 (23%)	47 (77%)	61 (100%)	0.04
50 - 59 years	18 (16.5%)	91 (83.5%)	109 (100%)	
≥ 60 years	25 (31.6%)	54 (68.4%)	79 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

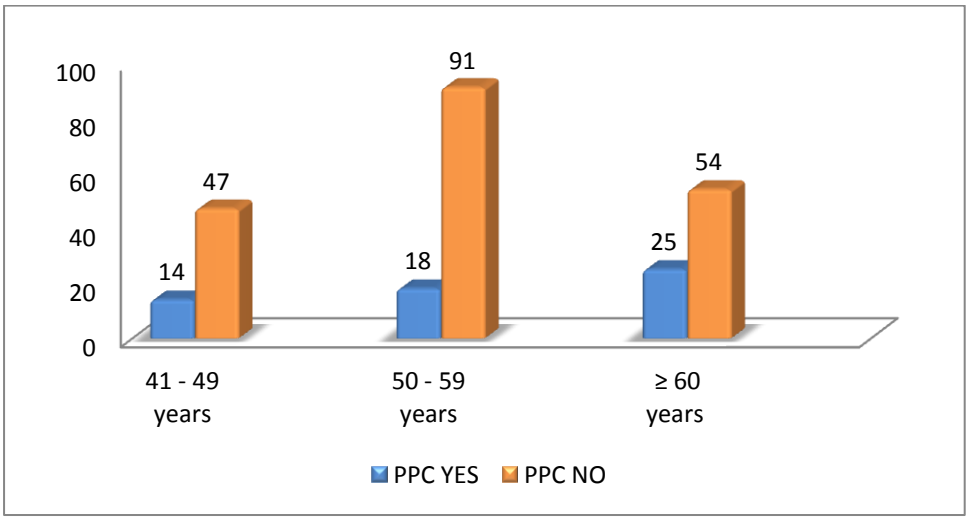


Fig 13: Age and postoperative pulmonary complications

31.6% of patient ≥ 60 years of age and 23% of patients between 41 to 49 years of age had postoperative pulmonary complication. There was a statistically significant increase in postoperative pulmonary complications in patients ≥ 60 years of age (p value – 0.04)

Table 27 : Gender and postoperative pulmonary complications

GENDER	POSTOP PULMONARY COMPLICATION		Total	Chi sq p value
	YES	NO		
MALE	46 (23.7%)	148 (76.3%)	194 (100%)	
FEMALE	11 (20%)	44 (80%)	55 (100%)	0.563
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

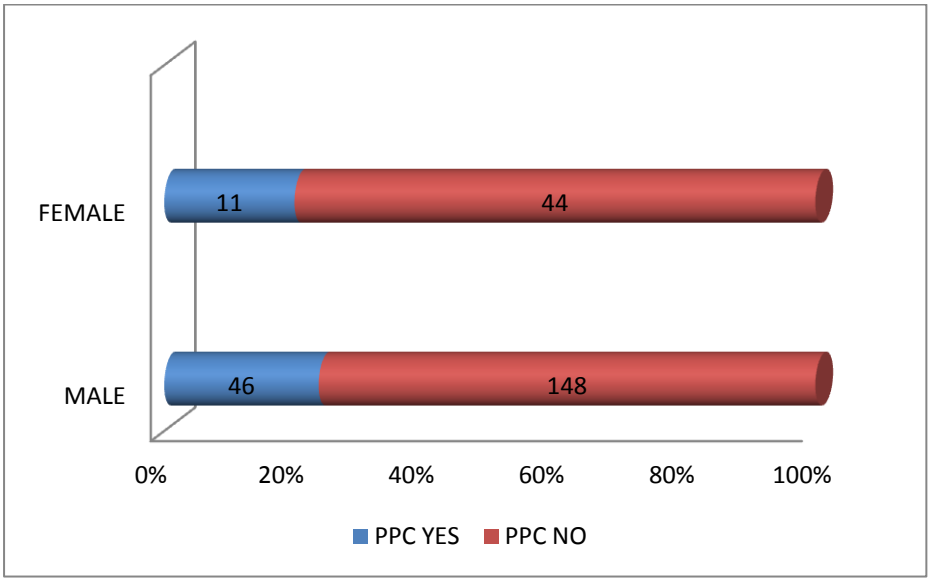


Fig 14: Gender and postoperative pulmonary complications

23.7% of males and 20% of females had postoperative pulmonary complications. There was no statistical significance between male and female patients in developing postoperative pulmonary complications.

Table 28: mMRC grading and postoperative pulmonary complications

mMRC GRADING	POSTOP PULMONARY COMPLICATION		Total	Fisher exact p value
	YES	NO		
0	1 (5.3%)	18 (94.7%)	19 (100%)	0.001
1	17 (14.9%)	97 (85.1%)	114 (100%)	
2	29 (31.5%)	63 (68.5%)	92 (100%)	
3	10 (41.7%)	14 (58.3%)	24 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

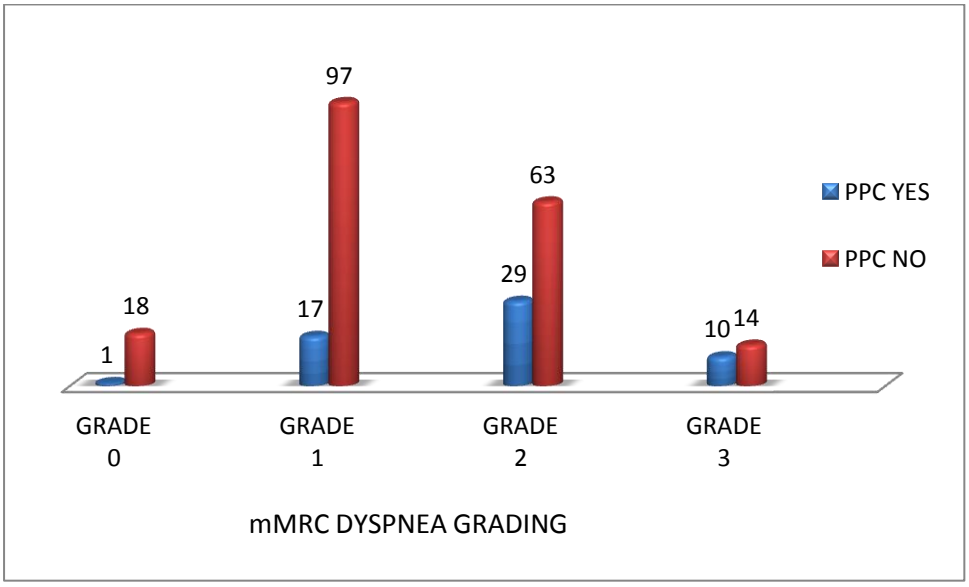


Fig 15*: *mMRC grading and postoperative pulmonary complications

41.7% of patients with grade 3 mMRC, 31.5% with grade 2 mMRC, 14.9% with grade 1 mMRC and 5.3% with grade 0 mMMRC developed postoperative pulmonary complications. There was a statistically significant increase in postoperative pulmonary complications in patients with grade 3 mMRC (p value – 0.001).

Table 29: Number of exacerbation and postoperative pulmonary complications

NO OF EXACERBATION	POSTOP PULMONARY COMPLICATION		Total	Fisher exact p value
	YES	NO		
0	19 (10.8%)	139 (89.2%)	158 (100%)	0.001
1	20 (35.3%)	32 (64.7%)	52 (100%)	
2	19 (48%)	20 (52%)	39 (100%)	
Total	57 (22.89%)	192 (77.1%)	249 (100%)	

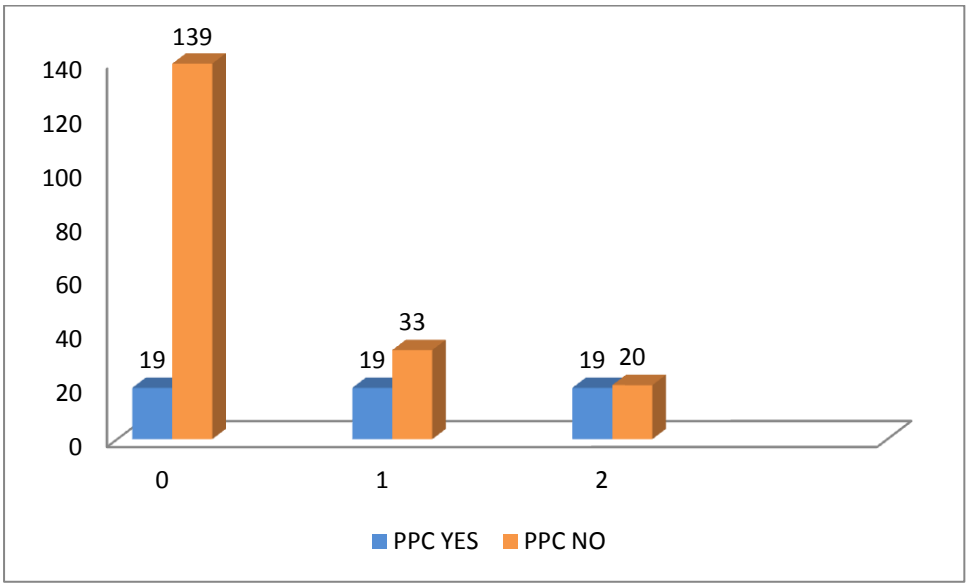


Fig 16: Number of exacerbation and postoperative pulmonary complications

48% of the patients with 2 exacerbations (Grade C), 35.3% with one exacerbation and 10.8% with no exacerbation developed postoperative pulmonary complications. There was a statistically significant increase in postoperative pulmonary complications in patients with more than one exacerbations (p value – 0.001).

Table 30: Number of hospitalisation and postoperative pulmonary complications

NO OF HOSPITALISATION	POSTOP PULMONARY COMPLICATION		Total	Fisher exact p value
	YES	NO		
0	29 (13.8%)	181 (86.19%)	210 (100%)	0.001
≥ 1	28 (71.8%)	11 (28.2%)	39 (100%)	
Total	57 (22.89%)	192 (77.1%)	249 (100%)	

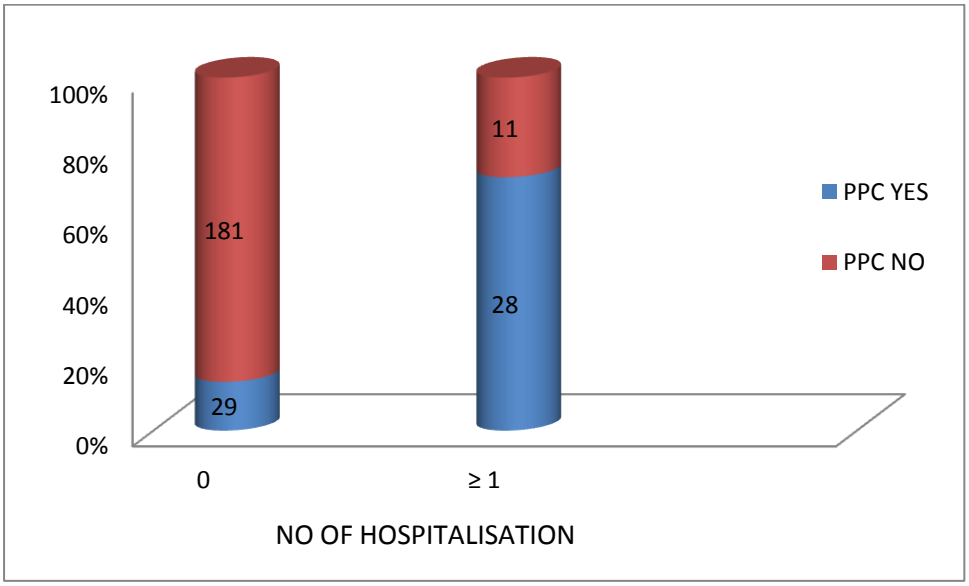


Fig 17: Number of hospitalisation and postoperative pulmonary complications

71.8% of the patients with history of ≥ 1 hospitalization developed postoperative pulmonary complications. There was a statistically significant increase in postoperative pulmonary complications in patients with history of ≥ 1 hospitalization (p value – 0.001).

Table 31: Respiratory infection in the last month

RESPIRATORY INFECTION IN LAST MONTH	POST OP PULMONARY COMPLICATION		Total	p value
	YES	NO		
YES	23 (39.7%)	35 (60.3%)	58 (100%)	0.0005
NO	34 (17.8%)	157 (82.2%)	191 (100%)	
Total	57 (22.89%)	192 (77.1%)	249 (100%)	

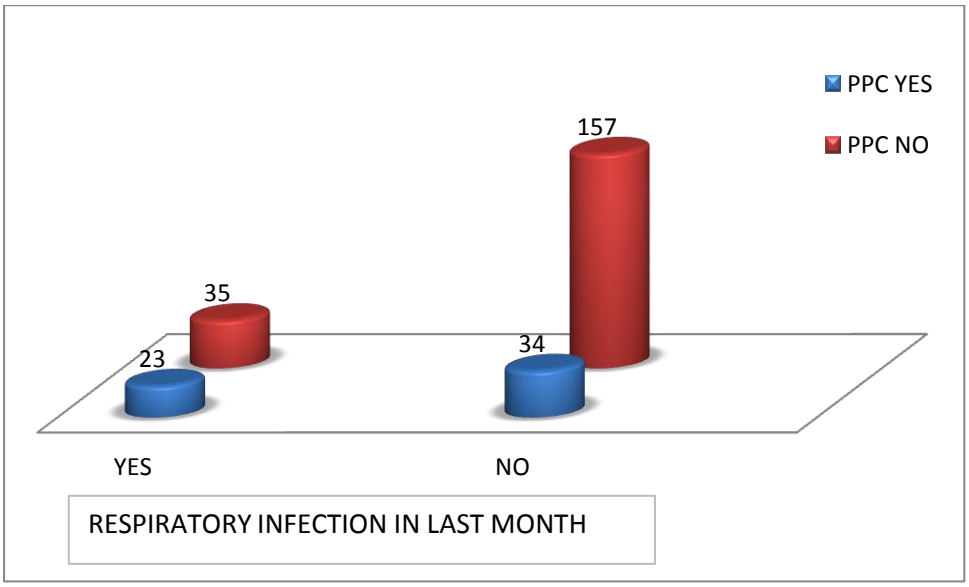


Fig18: Distribution of patients with respiratory infection in the last month

39.7% of patients with history of respiratory infection in the last month developed postoperative pulmonary complications, among them 60% had respiratory failure. There was a statistically significant increase in postoperative pulmonary complications in patients with history of respiratory tract infection in the last month (p value – 0.005).

Table 32: Degree of airflow limitation and postoperative pulmonary complications

FEV1 RANGE	POSTOP PULMONARY COMPLICATION		Total	Fisher exact p value
	YES	NO		
Mild	1 (6.25%)	15 (93.75%)	16 (100%)	0.001
Moderate	31 (17.7%)	144 (82.3%)	175 (100%)	
Severe	22 (41.5%)	31 (58.5%)	53 (100%)	
Very severe	3 (60%)	2 (40%)	5 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

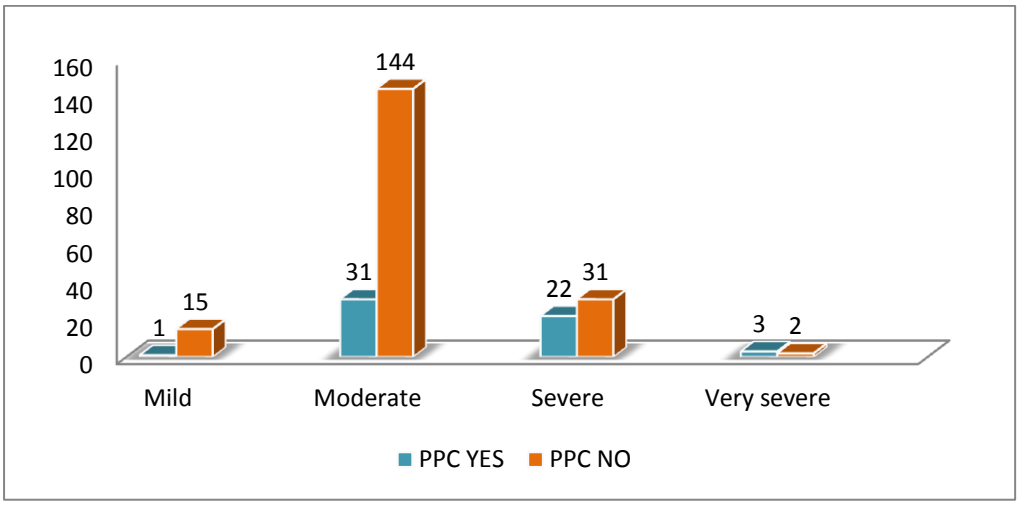


Fig 19: Degree of airflow limitation and postoperative pulmonary complications

60% patients with very severe airflow limitation (< 30% predicted), 41.5% with severe airflow limitation (30 to 50% predicted), 17.7% with moderate degree of airflow limitation (50 to 80% predicted) and 6.25% with mild airflow limitation (> 80% predicted) developed postoperative pulmonary complications. There was a statistically significant increase in postoperative pulmonary complications in patients with FEV1 ≤ 50% predicted (p value – 0.005).

Table 33: BMI and postoperative pulmonary complications

BMI RANGE	POSTOP PULMONARY COMPLICATION		Total	Fisher exact p value
	YES	NO		
< 18.5 (underweight)	4 (28.6%)	10 (71.4%)	14 (100%)	0.104
18.5 - 24.9 (normal)	42 (23.1%)	140 (76.9%)	182 (100%)	
25 - 29.9 (overweight)	7 (15.6%)	38 (84.4%)	45 (100%)	
≥ 30 (obese)	4 (50%)	4 (50%)	8 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

28.6% of underweight patients, 23.1% of normal weight patients, 15.6 % of overweight patients and 50% of obese patients had postoperative pulmonary complications. There was no statistical significance among the groups in development of pulmonary complications.

Table 34: Smoking status and postoperative pulmonary complications

SMOKING STATUS	POSTOP PULMONARY COMPLICATION		Total	Chi sq p value
	YES	NO		
Current Smoker	22 (39.3%)	34 (60.7%)	56 (100%)	0.003
Former Smoker	24 (19.5%)	99 (80.5%)	123 (100%)	
Never Smoker	11 (15.7%)	59 (84.3%)	70 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

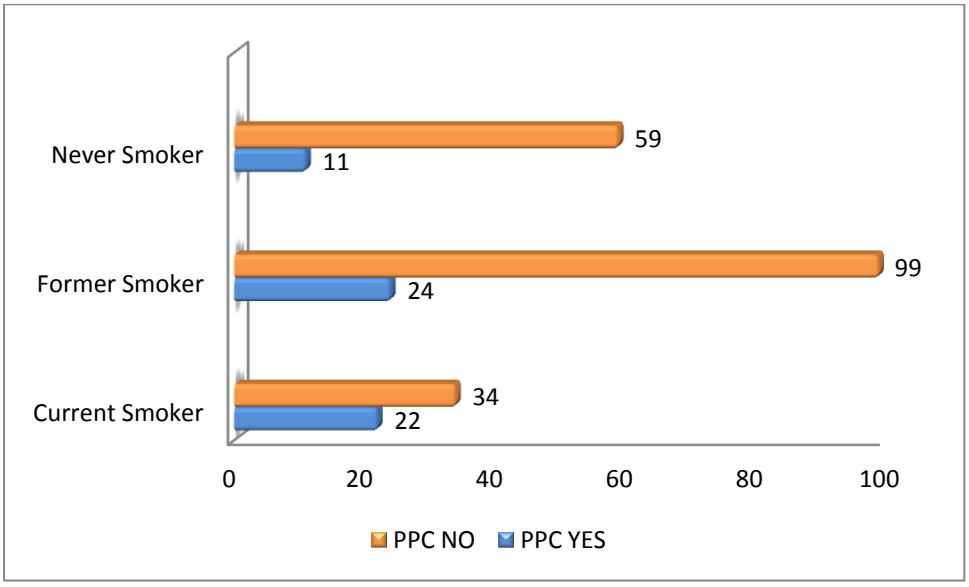


Fig 20: Smoking status and postoperative pulmonary complications

39.3% of current smokers, 19.5% of former smokers and 15.7% of never smokers had postoperative pulmonary complications. There was a statistically significant increase in postoperative pulmonary complications in current smokers (p value – 0.003).

Table 35: Pack years and postoperative pulmonary complications

PACK YEARS	POSTOP PULMONARY COMPLICATION		Total	Chi sq p value
	YES	NO		
< 1	11 (15.1%)	62 (84.9%)	73 (100%)	0.0001
1 – 20	11 (13.1%)	73 (86.9%)	84 (100%)	
21 - 39	23 (34.3%)	44 (65.7%)	67 (100%)	
≥ 40	12 (48%)	13 (52%)	25 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

48% of patients with ≥ 40 pack years, 34.3% with 21 – 39 pack years and 13.1% with 1 – 20 pack years had postoperative pulmonary complications. There was a statistically significant increase in postoperative pulmonary complications in patients with ≥ 40 pack years smoking history. ($p < 0.001$)

Table 36: General health status and postoperative pulmonary complications

ASA CLASS	POSTOP PULMONARY COMPLICATION		Total	Fisher exact p value
	YES	NO		
1	0 (0%)	8 (100%)	8 (100%)	0.001
2	32 (17.4%)	152 (82.6%)	184 (100%)	
3	22 (42.3%)	30 (57.7%)	52 (100%)	
4	3 (60%)	2 (40%)	5 (100%)	
Total	57 (22.89%)	192 (77.1%)	249 (100%)	

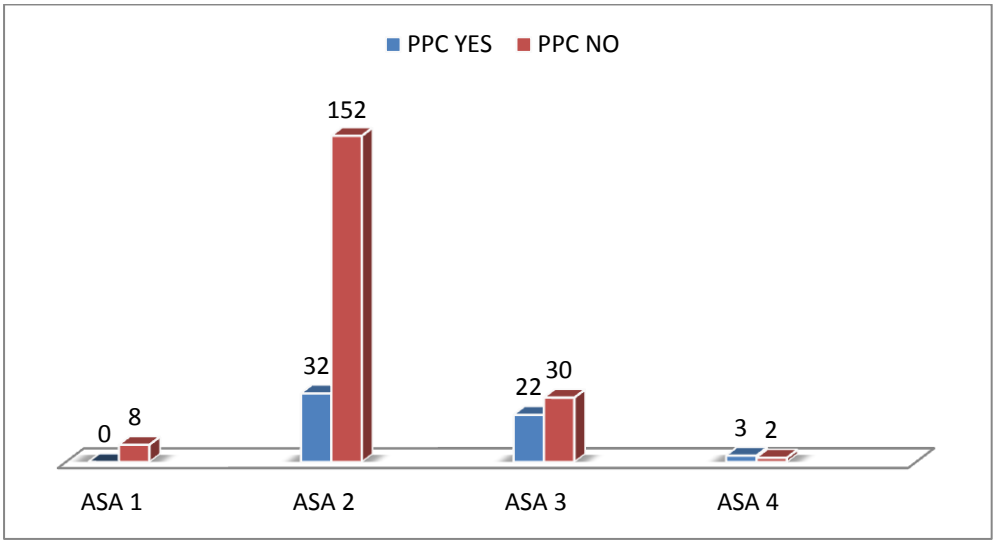


Fig 21: ASA and postoperative pulmonary complications

60% of ASA 4 patients, 42.3% of ASA 3 patients , 17.4% of ASA 2 patients had postoperative pulmonary complications. No patients with ASA 1 developed complication. There was a statistically significant increase in postoperative pulmonary complications when the general health status of the patients is ASA 4. (p value - 0.001)

Table 37: Diabetes mellitus and postoperative pulmonary complications

DM	POSTOP PULMONARY COMPLICATION		Total	Chi sq p value
	YES	NO		
YES	5 (27.8%)	13 (72.3%)	18 (100%)	0.608
NO	52 (22.5%)	179 (77.5%)	231 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

27.8% of patients with diabetes mellitus had postoperative pulmonary complications

Table 38: Systemic hypertension and postoperative pulmonary complications

SHT	POSTOP PULMONARY COMPLICATION		Total	Chi sq p value
	YES	NO		
YES	1 (7.7%)	12 (92.3%)	13 (100%)	0.180
NO	56 (23.7%)	180 (76.37%)	236 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

7.7% of patients with systemic hypertension had postoperative pulmonary complications.

Both diabetes mellitus and systemic hypertension had no statistical significance in development of postoperative pulmonary complications.

Table 39: Preoperative oxygen saturation and postoperative pulmonary complications

Spo2	POSTOP PULMONARY COMPLICATION		Total	Chi sq p value
	YES	NO		
≥ 96%	52 (21.8%)	187 (78.2%)	239 (100%)	0.037
91 - 95%	5 (50%)	5 (50%)	10 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

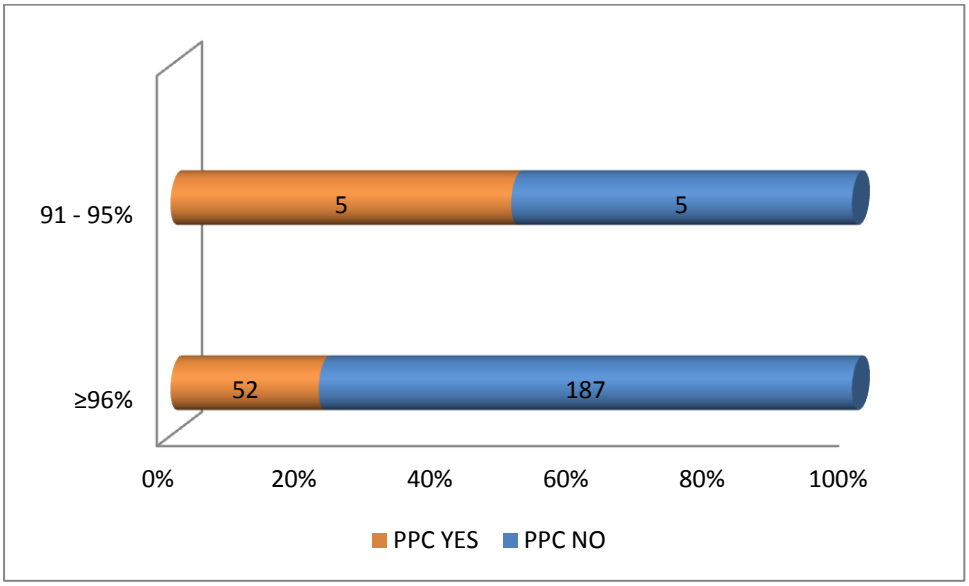


Fig 22: Preoperative spo2 and postoperative pulmonary complications

50% of patients with oxygen saturation (Spo2) between 91 – 95 % and 21.8% with oxygen saturation of ≥ 96% had postoperative pulmonary complications. There was a statistically significant increase in postoperative pulmonary complications when the preoperative oxygen saturation is ≤ 95% (p value - 0.037)

Table 40: Preoperative haemoglobin status and postoperative pulmonary complications

Hb	POSTOP PULMONARY COMPLICATION		Total	Chi sq p value
	YES	NO		
≤ 10	5 (16.1%)	26 (83.9%)	31 (100%)	0.39
> 10	52 (23.9%)	166 (76.1%)	218 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

23.9% of patients with haemoglobin of > 10 gm/dl and 16.1% with haemoglobin ≤ 10 gm/dl had postoperative pulmonary complications. There was no statistical significance among the groups in development of postoperative pulmonary complications.

Table 41: Mode of surgery and postoperative pulmonary complications

MODE OF SURGERY	POSTOP PULMONARY COMPLICATION		Total	Chi sq p value
	YES	NO		
Laparotomy	53 (28.2%)	135 (71.8%)	188 (100%)	0.0004
Laparoscopy	4 (6.6%)	57 (93.4%)	61 (100%)	
Total	57 (22.89%)	192 (77.1%)	249 (100%)	

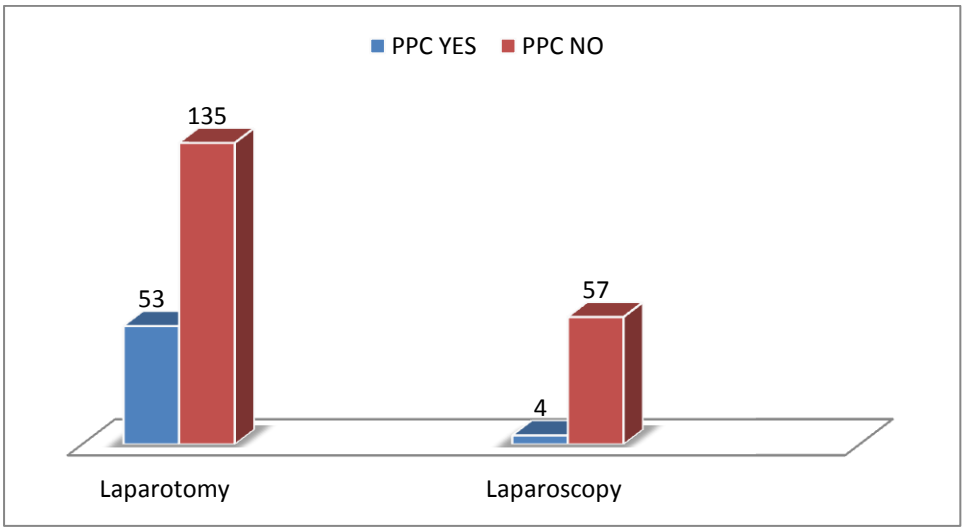


Fig 23: Mode of surgery and postoperative pulmonary complications

Among the patients who underwent open abdominal surgery (laparotomy) and laparoscopic surgery 28.2% and 6.6% of patients had postoperative pulmonary complications respectively. There was a statistically significant decrease in postoperative pulmonary complications when the patient underwent laparoscopic abdominal surgery (p value < 0.001)

Table 42: Type of anaesthesia and postoperative pulmonary complications

TYPE OF ANAESTHESIA	POSTOP PULMONARY COMPLICATION		Total	Chi sq p value
	YES	NO		
GA	44 (33.8%)	86 (66.2%)	130 (100%)	<0.001
Regional	13 (10.9%)	106 (89.1%)	119 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

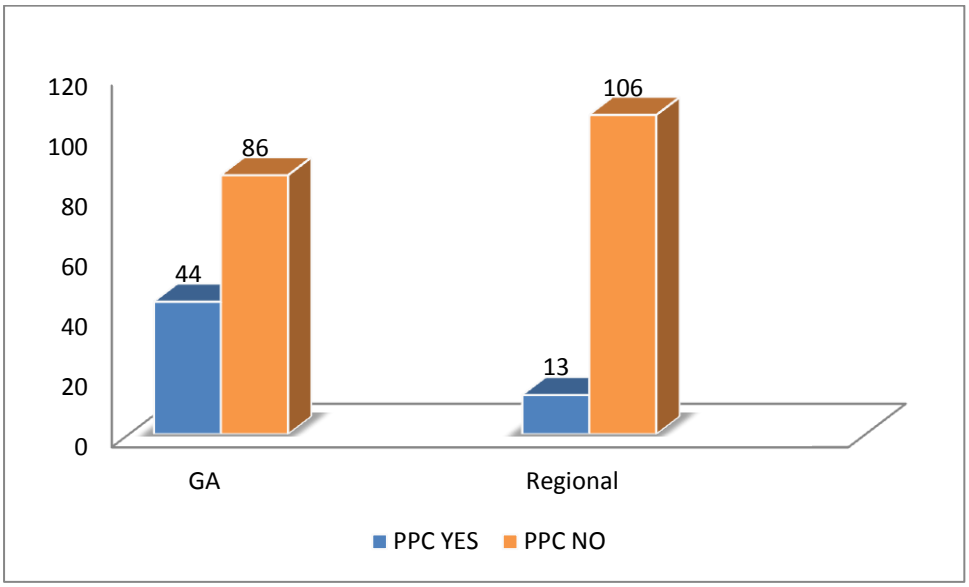


Fig 24: Type of anaesthesia and postoperative pulmonary complications

Among the patients who underwent surgery under general anaesthesia and regional anaesthesia, 33.8% and 10.9% had postoperative pulmonary complications respectively. There was a statistically significant increase in postoperative pulmonary complications when the patient underwent surgery under general anaesthesia. (p value < 0.001)

Table 43: Incision site and postoperative pulmonary complications

SURGICAL INCISION SITE	POSTOP PULMONARY COMPLICATION		Total	Chi sq p value
	YES	NO		
Upper abdominal	47 (34.6%)	89 (65.4%)	136 (100%)	<0.001
Lower abdominal	10 (8.8%)	103 (91.2%)	113 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

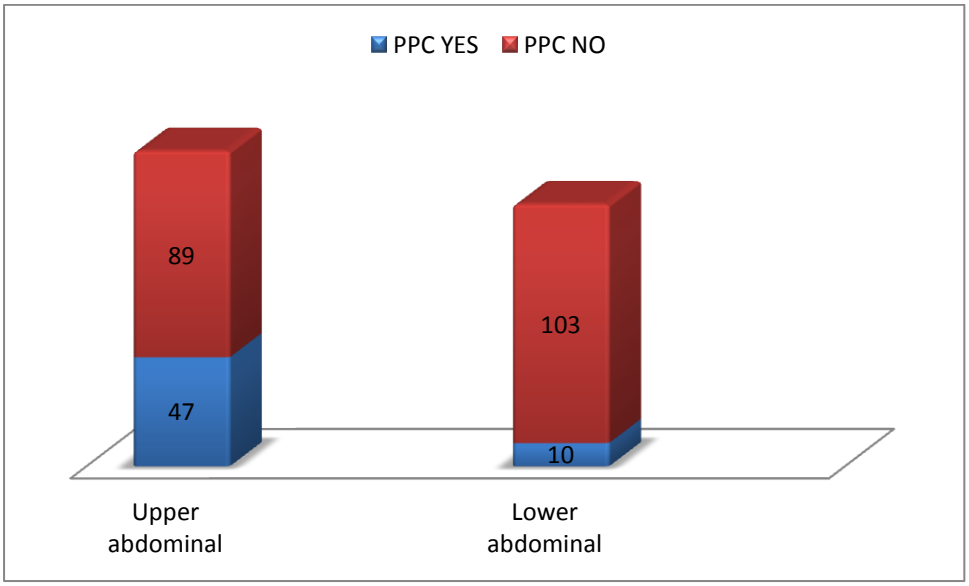


Figure 25: Incision site and postoperative pulmonary complications

34.6% of patients with upper abdominal surgical site incision developed postoperative pulmonary complications. There was a statistically significant increase in postoperative pulmonary complications when the patient had upper abdominal surgical site incision (p value < 0.001).

Table 44: Duration of surgery and postoperative pulmonary complications

DURATION OF SURGERY	POSTOP PULMONARY COMPLICATION		Total	Chi sq p value
	YES	NO		
< 2 HRS	13 (13.3%)	85 (86.7%)	98 (100%)	<0.001
2 – 3 HRS	6 (7.4%)	75 (92.6%)	81 (100%)	
> 3 HRS	38 (54.3%)	32 (45.7%)	70 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

54.3% of patients with duration of surgery > 3 hours and 13.3% with surgery < 2 hours had postoperative pulmonary complications. There was a statistically significant increase in postoperative pulmonary complications when the duration of surgery is > 3 hours (p value < 0.001).

Table45: Intraoperative blood transfusion and postoperative pulmonary complications

INTRAOP BLOOD TRANSFUSION	POSTOP PULMONARY COMPLICATION		Total	p value
	YES	NO		
YES	19 (70.4%)	8 (29.6%)	27 (100%)	<0.001
NO	38 (17.1%)	184 (82.8%)	222 (100%)	
Total	57 (22.9%)	192 (77.1%)	249 (100%)	

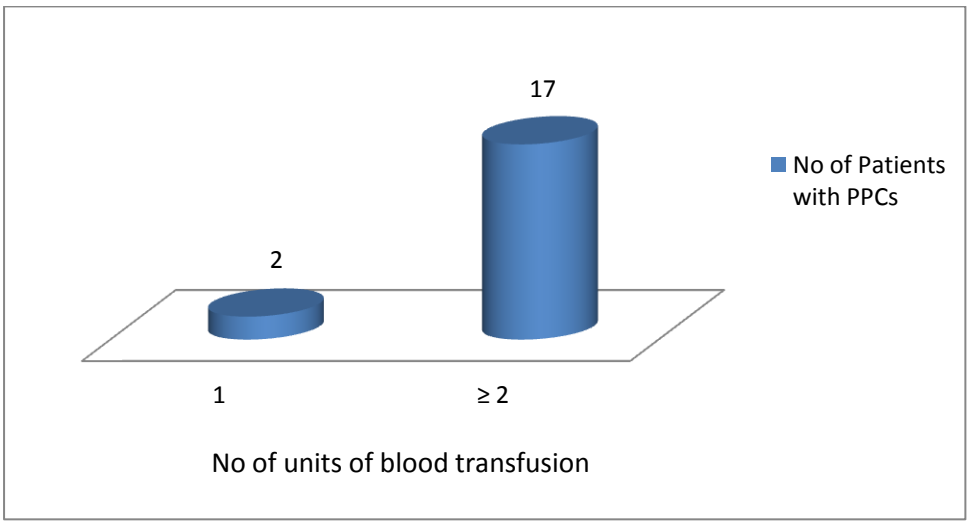


Figure 26: Number of units of blood transfusion and pulmonary complications

70.4% of patients with intraoperative blood transfusion had postoperative pulmonary complications. There was a statistically significant increase in postoperative pulmonary complications when intraoperative blood transfusion was ≥ 2 units (p value < 0.001).

Table 47: ARISCAT risk index and postoperative pulmonary complications

ARISCAT risk index	POSTOP PULMONARY COMPLICATION		**Total**
	YES	NO	
LOW	2 (2.6%)	75 (97.4%)	77 (100%)
MODERATE	42 (27.3%)	112 (72.7%)	154 (100%)
HIGH	13 (72.2%)	5 (27.8%)	18 (100%)
Total	57 (22.9%)	192 (77.1%)	249 (100%)

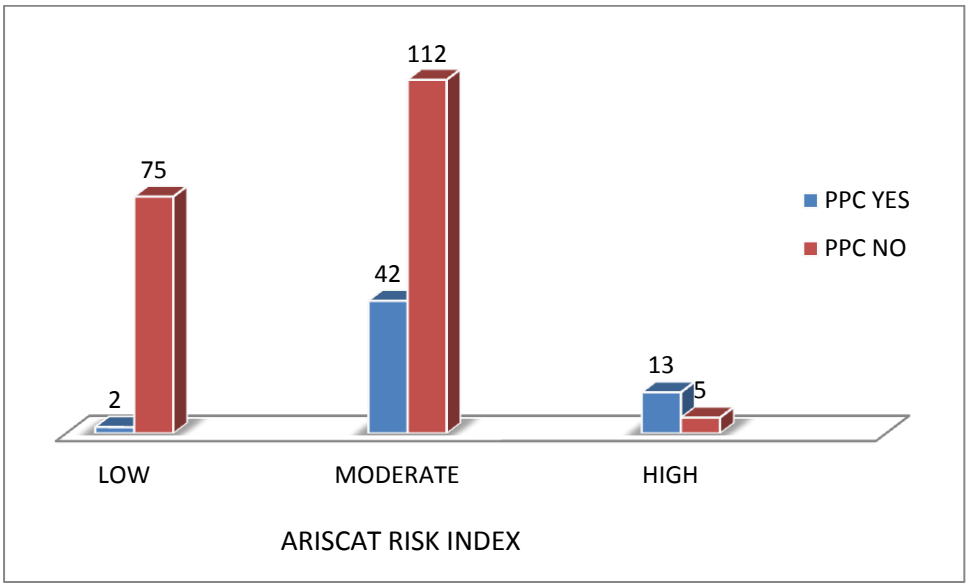


Fig 28: ARISCAT risk index and postoperative pulmonary complications

72.2% of the patients with high risk index, 27.3% of patients with moderate risk index and 2.6% of patients with low risk index developed postoperative pulmonary complications.

Table 48: Prediction of postoperative pulmonary complications by ARISCAT risk index

ARISCAT SCORE	B	Sig.	Odds ratio [exp(B)]	95% Confidence Interval for Odds ratio		McFadden R^2
				Lower Bound	Upper Bound	
Intercept (CONSTANT)	3.624	0.0001				0.178
HIGH	4.580	0.0001	97.500	17.073	556.791	
MODERATE	2.644	0.0001	14.062	3.304	59.851	
LOW	0					

Multi nominal logistical regression was used. Compared to low ARISCAT score, high scorers had 97.5 odds (17.1 – 556.8) of getting postoperative pulmonary complications and moderate scorers had 14.06 (3.3 – 59.9) odds of developing postoperative pulmonary complications. The ARISCAT score index has 17.8% predictability for postoperative pulmonary complications.

Table 49: Duration of stay and postoperative pulmonary complications

	GROUP	n	MEAN	STD. DEVIATION
POST SURGERY DURATION OF HOSPITAL STAY IN DAYS	PPC YES	57	13.72	4.30
	PPC NO	192	4.38	2.39
LENGTH OF ICU STAY IN DAYS	PPC YES	57	3.14	3.06
	PPC NO	192	0.21	0.60

The mean duration of post surgery hospital stay in patients who had postoperative pulmonary complications and those who did not had postoperative complications were 13.72 days and 4.38 days respectively.

The mean duration of ICU stay in patients had postoperative pulmonary complications and those not developed complication was found to be 3.14 days and 0.21 days respectively.

DISCUSSION

This cross sectional study was conducted on 249 Chronic Obstructive Pulmonary Disease patients undergoing elective abdominal surgery in Rajiv Gandhi Government General Hospital. This research was done in order to study the incidence of postoperative pulmonary complications and correlation of preoperative and intraoperative risk factors in development of postoperative pulmonary complications.

In the present study, the postoperative pulmonary complications (PPCs) incidence was 23%. The incidence of postoperative pulmonary complications in upper abdominal surgeries is around 34.6%. Figen Atalay et al [6] reported a similar incidence of 22% in COPD patients undergoing abdominal surgeries. Kamlesh Patel et al [39] study showed an incidence of 25 % in case of elective abdominal surgeries. Hyung-Jun Kim et al [13] reported a higher incidence of 29 % in COPD patients undergoing elective abdominal surgery. In the NSQIP observational study the incidence is around 22% and the subjects included were COPD patients who underwent all type of surgery. Tae hoon Kim et al [5] found that 16.3% of COPD patients undergoing abdominal surgery developed postoperative pulmonary complications. Higher incidence of about 37% was reported in David H. Wong et al [53] in which the subjects included were only severe COPD patients.

The respiratory failure (10.8%) was the most common complication in the study population followed by atelectasis and pneumonia (8.8%) which is similar to the study done by David H. Wong et al [53] and Himani Gupta et al.

Hyung-Jun Kim et al [13] and Abraham et al [8] states that pneumonia followed by atelectasis and respiratory failure as the most common complications in their study populations. There may be individual differences in the study population and type of surgery leading to differences in the incidence of various complications.

Among the patients who developed postoperative pulmonary complications 51% of the patients had respiratory failure, 38.6% had pneumonia or atelectasis, 15.8% had exacerbation of COPD, 5.3% had pleural effusion and 1.7% developed pulmonary thromboembolism. 3% of the patient died due to pulmonary complications. 45% of the patients had more than one postoperative pulmonary complications. 21% had both respiratory failure and pneumonia.

This study correlated PPCs with many of the pre-operative and intraoperative risk factors which includes

AGE:

There was almost a linear trend in correlation of age with postoperative pulmonary complications. Increase in age of the patients had a significant increase in development of postoperative pulmonary complications.

Smetana et al [12] done a systematic review and found that advanced age is an important independent predictor of postoperative pulmonary complications. When compared with patients <50 years old, patients aged 50 - 59 years, 60 - 69 years had odds ratios (OR) of 1.5 (CI 1.31-1.71) and 2.28 (CI 1.86-2.80, respectively, of developing postoperative pulmonary complications.

mMRC DYSPNEA SCALE :

The dyspnoea graded using mMRC scale had a linear association with incidence of postoperative pulmonary complications. Patients with grade 3 and grade 4 mMRC had a significant increase in development of postoperative pulmonary complications.

Miyahara S et al found that patient's subjective dyspnoea was significantly related to postoperative respiratory complications [20]. Hyung jun Kim et al found mMRC grading had no significance in developing postoperative pulmonary complications.[13]

RISK ASSESSMENT:

Patients with history of more than one exacerbations and ≥ 1 hospitalisations in the previous year had a significant association with development of postoperative pulmonary complications.

Hyung jun Kim et al [13] and Tae hoon Kim et al [5] found that patients with ≥ 2 exacerbation or ≥ 1 hospital admission due to hospitalisation in the previous year had significant risk in development of postoperative pulmonary complications. [13]

RESPIRATORY INFECTION IN THE LAST MONTH:

There was a statistically significant increase in postoperative pulmonary complications in patients with history of respiratory tract infection in the last month (p value – 0.005) which is similar to canet et al study [23].

BODY MASS INDEX:

28.6% of underweight patients, 23.1% of normal weight patients, 15.6 % of overweight patients and 50% of obese patients had postoperative pulmonary complications. In our study, there was statistically no significance in development of postoperative pulmonary complications with respect to BMI. Many studies had shown patients with low BMI developed more postoperative pulmonary complications. [26,28]

SMOKING STATUS:

In our study current smokers was significantly associated (p=0.003) with the development of postoperative pulmonary complications. 48% of patients with ≥ 40 pack years smoking history had postoperative pulmonary complications which is statistically significant (p=0.0001).

In a meta-analysis preoperative smoking was associated with an increased risk of postoperative pulmonary complications with relative risk of 1.73 [16]. Warner et al found smokers with a greater than 20 pack-year smoking history had a higher incidence of postoperative pulmonary complications than those with a lesser pack-year history [17].

COMORBID ILLNESS:

In our study population patients with diabetes mellitus and systemic hypertension had no statistical significance in development of postoperative pulmonary complications.

GENERAL HEALTH STATUS:

ASA status of the subjects in the study population had a significant linear association with the development of postoperative pulmonary complications, Tae hoon Kim et al [5] also reported a similar finding.

Wong et al [53] states elucidated 75% risk of developing postoperative pulmonary complications among subjects with ASA of 4 whereas in our study 60% individuals with ASA of 4 developed complications. Elif Kupeli et al [50] found ASA classification was found to be a weaker modality to predict pulmonary complications.

DEGREE OF AIRFLOW LIMITATION

The subjects with mild to moderate airflow limitation in the study population was 76.7% and severe and more severe airflow limitation were 23.3%. The incidence of postoperative pulmonary complications in the subjects with mild to moderate airflow limitation was 20.12%. Kim et al [5] states that postoperative pulmonary complications among people with mild to moderate COPD as 12%. Wong et al [53] estimated an incidence of 37% among people with severe airflow limitation whereas in the present study it was 75%. The difference in type and duration of surgery along with history of more hospitalisation for exacerbation attributed to the increased difference in the incidence of postoperative pulmonary complications in the current population. The present study showed a statistically significant increase in postoperative pulmonary complications in patients with FEV1 $\leq$ 50% predicted (p value – 0.005) which is similar to Fuso L et al study [31]

PREOPERATIVE OXYGEN SATURATION:

A preoperative SpO2 of ≤ 95% had a significant association with incidence of postoperative pulmonary complication (p value - 0.037). In a similar study done by Canet et al [23] found that preoperative SpO2 ≤ 95% was an important independent predictor of developing postoperative pulmonary complication.

PREOPERATIVE ANEMIA:

In our study, there was statistically no significance in development of postoperative pulmonary complications with respect to preoperative haemoglobin status. In a study done by Jaume Canet et al [23] found that patients with preoperative anemia (Haemoglobin <10 gm/dl) had a three-fold increase in risk of developing postoperative pulmonary complication. The difference in the association may be attributed to more number of emergency surgeries included in the canet et al study.

MODE OF SURGERY:

In our study there was a statistically significant decrease in postoperative pulmonary complications when the patient underwent laparoscopic abdominal surgery (p value < 0.001). In a similar study done by Frazee et al and Hall et al [44,46] found that laparoscopic cholecystectomy, when compared with open cholecystectomy, demonstrates better preservation and faster recovery of lung volumes, less postoperative pain and a lower incidence of postoperative pulmonary complications.

SURGICAL SITE INCISION:

In our study when the patient had upper abdominal surgical site incision there was a statistically significant increase in postoperative pulmonary complications (p value < 0.001).

In a systematic review postoperative pulmonary complication rate is significantly higher for upper abdominal surgery than for lower abdominal surgery and postulated that the distance of the surgical incision from the diaphragm is inversely related to incidence of postoperative complications.

DURATION OF SURGERY:

The duration of surgery played an important role in the development of postoperative pulmonary complications. Almost 54.3% of the subjects those who had surgery more than 3 hours developed postoperative pulmonary complications. Abraham et al and Kamlesh et al [39] studies also showed a significant association. Wong et al [53] study found that 61% of the subjects developed PPC when surgery was prolonged for more than four hours.

In our study when the patient had intraoperative blood transfusion there was a statistically significant increase in postoperative pulmonary complications (p value < 0.001). Olubukola O et al also reported a similar finding [48].

ARISCAT RISK INDEX:

The ARISCAT score index was estimated to predict the postoperative pulmonary complications among the subjects. 72% of the subjects with high risk score and 27% of them with intermediate risk score had postoperative pulmonary complications. This almost matched with the results of Kupeli et al [50] study which showed 75% postoperative pulmonary among high risk score subjects and 20% among intermediate risk score subjects. When adjusted for other factors, the ARISCAT score had 17.8% predictability for PPC. High risk ARISCAT score subjects had 97.5 odds and intermediate score subjects had 14 odds of getting PPC compared to low risk score subjects.

In our study postoperative pulmonary complications resulted in the longest length of post surgery hospital and ICU stay , this was similar to Kamlesh et al [39] and gupta et al study [3]

.

CONCLUSION

1. In our study 23% of COPD patients undergoing elective abdominal surgery developed postoperative pulmonary complications.
2. The most common complication was respiratory failure (10.8%) followed by pneumonia and atelectasis (8.8%).
3. 3 patients died due to postoperative pulmonary complications.
4. Significant risk factors for development of postoperative pulmonary complications in our study includes:
    - Age > 60 years
    - Grade 3 mMRC
    - Respiratory infection in the past month
    - History of more than one exacerbations and ≥ 1 hospitalisations in the previous year
    - Current smoker, pack years > 40
    - FEV1% ≤ 50% (GOLD 3, GOLD 4)
    - Preoperative SpO2 < 96%
    - ASA ≥ 3
    - General anaesthesia
    - Laparotomy
    - Upper abdominal surgical site incision
    - Duration of surgery > 3 hrs

5. Postoperative pulmonary complications increased the post surgery duration of hospital and ICU stay.

6. ARISCAT risk index is a potential tool to predict postoperative pulmonary complications. It also has the advantage of being simple to calculate manually. In our study 72% of patient at high risk and 27% at intermediate risk developed postoperative pulmonary complication. Patient with lower score had significant lower complications. Thus ARISCAT risk index is useful to stratify risk before surgery and, to identify patients most likely to benefit from risk-reduction interventions.

7. Thus in COPD patients undergoing abdominal surgery, postoperative pulmonary complications has to be predicted early and strategies need to be considered in high risk groups to reduce postoperative pulmonary complications by appropriate interventions.

Limitations

1. This is a cross sectional study performed at a single centre and no controls were included.
2. Emergency surgeries were excluded from the study because of difficulty in diagnosing the COPD patients due to lack of spirometric analysis facility at the precise time.
3. COPD patients with history of treated pulmonary tuberculosis were not included in the study and thus its impact could not be studied.
4. A prospective multicenter study with a broad spectrum of patients, ranging from those with normal lung functions to patients with very severe COPD, is required to confirm the results of the present study.

Recommendations

1. ARISCAT Risk Index can be used as one of the tool in preoperative pulmonary evaluation to stratify pulmonary risk.
2. Smoking cessation prior to elective surgery, appropriate bronchodilator therapy in symptomatic COPD patients, regional anaesthesia in very high risk patients , preoperative and postoperative interventions like deep breathing exercise, inspiratory muscle training or incentive spirometry are the strategies can be used to reduce postoperative pulmonary complications.

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ANNEXURES

ABBREVIATIONS

COPD - Chronic Obstructive Pulmonary DISEASE

WHO - World Health Organisation

FEV1 - Forced Expiratory Volume in 1 second

FVC - Forced Vital Capacity

GOLD - Global initiative for chronic Obstructive Lung Disease

OR - Odds Ratio

CI - Confidence Interval

BMI - Body Mass Index

FRC - Functional Residual Capacity

mMRC - Modified Medical Research Council

PPCs - Postoperative pulmonary complications

ARISCAT - The Assess Respiratory Risk in Surgical Patients in Catalonia

RR - Relative Risk

GA - General Anaesthesia

DM - Diabetes Mellitus

ASA - American Society of Anaesthesiology

SHT - Systemic Hypertension

MS - Microsoft

SPSS - Statistical Package for Social Sciences

ICU – Intensive Care Unit

Urkund Analysis Result

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"TO ANALYZE THE PREOPERATIVE RESPIRATORY STATUS AND POSTOPERATIVE RESPIRATORY COMPLICATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS UNDERGOING ABDOMINAL SURGERY IN A TERTIARY CARE HOSPITAL"

Dissertation submitted to The Tamil Nadu Dr.M.G.R. Medical University in partial fulfilment of the requirements for the degree of

Doctor of Medicine (M.D) in Tuberculosis and Respiratory Diseases

Branch – XVII

Institute of Thoracic Medicine, Madras Medical College &

Rajiv Gandhi Government General Hospital

The Tamil Nadu Dr. M.G.R. Medical University Chennai – 600032

Tamil Nadu

India

MAY 2018

PLAGIARISM CERTIFICATE

This is to certify that this dissertation work titled **"TO ANALYZE THE PREOPERATIVE RESPIRATORY STATUS AND POSTOPERATIVE RESPIRATORY COMPLICATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS UNDERGOING ABDOMINAL SURGERY IN A TERTIARY CARE HOSPITAL"** of the candidate **DR.P.P.RAMKUMAR** with registration number **201527002** for the award of MD in the branch of Tuberculosis & Respiratory diseases. I personally verified the urkund.com website for the purpose of plagiarism check. I found that uploaded thesis file contains from introduction to conclusion pages and result shows **1** percentage of plagiarism in the dissertation.

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INSTITUTIONAL ETHICS COMMITTEE
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CERTIFICATE OF APPROVAL

To
Dr.Ramkumar.P.P.
Post Graduate in M.D. TB&CD
Madras Medical College
Chennai 600 003

Dear Dr.Ramkumar.P.P.,

The Institutional Ethics Committee has considered your request and approved your study titled **"TO ANALYZE THE PREOPERATIVE RESPIRATORY STATUS AND POST-OPERATIVE RESPIRATORY COMPLICATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS UNDERGOING ABDOMINAL SURGERY IN A TERTIARY CARE HOSPITAL " - NO.21032016.**

The following members of Ethics Committee were present in the meeting hold on **01.03.2016** conducted at Madras Medical College, Chennai 3

1.Dr.C.Rajendran, MD.,	:Chairperson
2.Dr.R.Vimala,MD.,Dean,MMC,Ch-3	:Deputy Chairperson
3.Prof.Sudha Seshayyan,MD., Vice Principal,MMC,Ch-3	: Member Secretary
4.Prof.B.Vasanthi,MD.,Inst.of Pharmacology,MMC,Ch-3	: Member
5.Prof.P.Raghumani,MS, Dept.of Surgery,RGGGH,Ch-3	: Member
6.Dr.Baby Vasumathi, Director, Inst. of O&G,Ch-8	: Member
7.Prof.M.Saraswathi,MD.,Director, Inst.of Path,MMC,Ch-3:	Member
8.Prof.Srinivasagalu,Director,Inst.of Int.Med.,MMC,Ch-3	: Member
9.Tmt.J.Rajalakshmi, JAO,MMC, Ch-3	: Lay Person
10.Thiru S.Govindasamy, BA.,BL,High Court,Chennai	: Lawyer
11.Tmt.Arnold Saulina, MA.,MSW.,	:Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary - Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003

EVALUATION FORM

Name: Age: Sex: IP number:

Preoperative evaluation:

History of respiratory symptoms:

No of Exacerbation:

No of Hospitalisation:

Modified Medical Council grades (mMRC):

History of respiratory infection in past month:

Past history:

Smoking Status: Pack years:

Body Mass Index:

General examination:

Systemic examination:

Blood investigations:

Chest xray:

Spirometric analysis:

ASA class:

Intraoperative evaluation:

Type of anaesthesia:

Mode of surgery:

Site of surgical incision:

Duration of Surgery:

Postoperative evaluation:

Respiratory symptoms:

Chest-X Ray / CT chest:

Type of pulmonary complication:

Duration of ICU and hospital stay:

ARISCAT Risk Index

PATIENT INFORMATION SHEET

TITLE OF THE STUDY: **"To analyze the Preoperative respiratory status and Postoperative respiratory complications of Chronic Obstructive Pulmonary Disease patients undergoing abdominal surgery in a tertiary care hospital "**

We are conducting a study on among patients admitted in Rajiv Gandhi Government General Hospital, Chennai.

The purpose of this study is **"To analyze the Preoperative respiratory status and Postoperative respiratory complications of Chronic Obstructive Pulmonary Disease patients undergoing abdominal surgery in a tertiary care hospital"**

We are selecting cases based on the inclusion and exclusion criteria of the study and the selected patients will undergo preoperative clinical examination, basic blood investigations, CXR, spirometry, CT chest (if needed) and intraoperative assessment of parameters . Postoperatively pulmonary complications and other parameters will be analysed based on a study protocol.

The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.

The results of the special study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Signature of Investigator Signature of Participant

Date:

PATIENT CONSENT FORM

Study detail: **"To analyze the Preoperative respiratory status and Postoperative respiratory complications of Chronic Obstructive Pulmonary Disease patients undergoing abdominal surgery in a tertiary care hospital "**

Study centre: Rajiv Gandhi Government General Hospital, Chennai.

Patient's name:

Patient's age:

ID No:

Patient may check (√) these boxes

a) I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction. ❑

b) I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected. ❑

c) I understand that sponsor of the clinical study, others working on the sponsor's behalf, the ethical committee and the regulatory authorities will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study. ❑

d) I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well being or any unexpected or unusual symptoms. ❑

e) I hereby consent to participate in this study. ❑

f) I hereby give permission to undergo detailed clinical examination, radiographs ,blood investigations and surgical procedure as required. ❑

Signature/thumb impression

Patient's Name and Address:

Signature of Investigator

Study Investigator's Name: **Dr.Ramkumar.P.P**

ஆராய்ச்சி தகவல் தாள்

ஆராய்ச்சி தலைப்பு

ராஜீவ் காந்தி அரசு பொது மருத்துவமனையில் வயிற்று அறுவை சிகிச்சைக்காக உள்நோயாளியாக சேர்க்கப்படும் நோயாளிகளில், நாள்பட்ட மூச்சுக்குழாய் அடைப்பு நோய் உள்ளவர்களை கண்டறிந்து அவர்களின் அறுவைசிகிச்சைக்கு முன் உள்ள நுரையீரலின் செயல்திறனையும், அறுவை சிகிச்சைக்குப் பின் வரக்கூடிய நுரையீரல் தொடர்புடைய பாதிப்புகளையும் பற்றி கண்டறியும் ஆய்வு

ஆராய்ச்சியாளர் பெயர் : மருத்துவர்.பெ.பெ.ராம்குமார்

பங்கேற்பாளர் பெயர் :

ஆராய்ச்சியின் நோக்கம்

ராஜீவ் காந்தி அரசு பொது மருத்துவமனையில் வயிற்று அறுவை சிகிச்சைக்காக உள்நோயாளியாக சேர்க்கப்படும் நோயாளிகளில், நாள்பட்ட மூச்சுக்குழாய் அடைப்பு நோய் உள்ளவர்களை கண்டறிந்து அவர்களின் அறுவைசிகிச்சைக்கு முன் உள்ள நுரையீரலின் செயல்திறனையும், அறுவை சிகிச்சைக்குப் பின் வரக்கூடிய நுரையீரல் தொடர்புடைய பாதிப்புகளையும் பற்றி கண்டறிதல்.

இதன் மூலம் நாள்பட்ட மூச்சுக்குழாய் அடைப்பு நோய் உள்ளவர்களில் வயிற்று அறுவை சிகிச்சை மேற்கொள்வதற்கு முன் ஆராய வேண்டிய காரணிகளையும் அறுவை சிகிச்சைக்குப்பின் ஏற்பட கூடிய நுரையீரல் தொடர்புடைய விளைவுகளையும் பற்றிய ஆய்வும், அதைப்பற்றிய சிறந்த புரிதலும் ஏற்படும்.

ஆய்வு முறை

வயிற்று அறுவை சிகிச்சைக்காக உள்நோயாளியாக எம் மருத்துவமனையில் சேர்க்கப்படுவோரில் நாள்பட்ட மூச்சுக்குழாய் அடைப்பு நோய் உள்ளவர்கள் இந்த ஆய்வில் பங்குபெறுவர். அவர்களிடம், நோய் சம்பந்தப்பட்ட வரலாறு முற்றிலும் கேட்டறியப்படும். நுரையீரல் மற்றும் இதர உறுப்புகள் சம்பந்தப்பட்ட மருத்துவ பரிசோதனை செய்யப்படும். சளி பரிசோதனை, இரத்தப்பரிசோதனை, நெஞ்சுப்படம் (எக்ஸ்ரே) தேவைப்பட்டால், சி.டி.ஸ்கேன் பரிசோதனைகள் செய்யப்படும். அனைவருக்கும் நுரையீரல் செயல்திறன் பரிசோதனை செய்யயப்படும். அவர்களின்

அறுவை சிகிச்சை சம்மந்தப்பட்ட விவரங்கள் கேட்டறியப்படும். அறுவை சிகிச்சைக்குப் பின் நுரையீரல் தொடர்புடைய பாதிப்புகளைப் பற்றி ஆய்வு மேற்கொள்ளப்படும்.

நன்மைகள்

இந்த ஆய்வு மூலம் நாள்பட்ட மூச்சுக்குழாய் அடைப்பு நோய் உள்ளவர்களில் அறுவை சிகிச்சை மேற்கொள்வதன் முன் ஆராயவேண்டிய காரணிகளையும் அறுவை சிகிச்சைக்குப் பின் ஏற்படக் கூடிய நுரையீரல் தொடர்புடைய விளைவுகளையும் கண்டறிந்து அதன் மூலம் இந்நோயாளிகள் அறுவை சிகிச்சையால் ஏற்படக்கூடிய பாதிப்புகளை முன்னதாகவே கண்டறிந்து அதற்கு ஏற்ப சரியான தருணத்தில் சிகிச்சை அளிக்கலாம்.

ஆய்வாளரின் பெயர் பங்கு பெறுபவரின் பெயர்

ஆய்வாளரின் கையொப்பம் பங்கு பெறுபவரின் கையொப்பம்

ஆராய்ச்சி ஒப்புதல் படிவம்

ஆராயச்சியின் தலைப்பு

ராஜீவ் காந்தி அரசு பொது மருத்துவமனையில் வயிற்று அறுவை சிகிச்சைக்காக உள்நோயாளியாக சேர்க்கப்படும் நோயாளிகளில், நாள்பட்ட மூச்சுக்குழாய் அடைப்பு நோய் உள்ளவர்களை கண்டறிந்து அவர்களின் அறுவைசிகிச்சைக்கு முன் உள்ள நுரையீரலின் செயல்திறனையும், அறுவை சிகிச்சைக்குப் பின் வரக்கூடிய நுரையீரல் தொடர்புடைய பாதிப்புகளையும் பற்றி கண்டறியும் ஆய்வு

ஆய்வு நிலையம் : நெஞ்சக நோய் மருத்துவத் துறை,
சென்னை மருத்துவக் கல்லூரி சென்னை - 3.

பங்கு பெறுவரின் பெயர் :
பங்குபெறுபவரின் எண் :

பங்குபெறுபவர் இதனை (✓) குறிக்கவும்

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது. ☐

நான் இவ்வாய்வில் தன்னிச்சையாகதான் பங்கேற்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகி கொள்ளலாம் என்றும் அறிந்து கொண்டேன். ☐

இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக்கொள்ளவும் அதை பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கின்றேன். ☐

இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக்கொள்கிறேன். எனக்கு கொடுக்கப்பட்ட அறிவுரைகளின்படி நடந்து கொள்வதுடன் 'இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்று உறுதியளிகிறேன். ☐

பங்கேற்பவரின் கையொப்பம் ..... இடம்..... தேதி.....

கட்டைவிரல் ரேகை

பங்கேற்பவரின் பெயர் மற்றும் விலாசம் .....

ஆய்வாளரின் கையொப்பம் ..... இடம்..... தேதி.....

ஆய்வாளரின் பெயர் .....

S.NO	AGE	AGE RANGE	GENDER	CHRONIC COUGH	CHRONIC SPUTUM	RESPIRATORY INFECTION IN LAST MONTH	mMRC GRADE	FEV1 SCORE	FEV1 RANGE	NO OF EXACERBATION	NO OF HOSPITALIZATION	BMI SCORE	BMI RANGE	SMOKING STATUS	PACK YEARS	BIOMASS EXPOSURE	DM	SHT	spo2	Hb	ASA	NAME OF SURGRY
1	63	3	1	2	2	2	2	43	3	2	0	23.5	2	1	3	2	2	2	1	2	3	Inguinal hernia
2	52	2	1	1	2	1	2	58	2	0	0	23.8	2	2	3	2	2	2	1	2	2	Nephrectomy
3	56	2	2	2	2	2	2	53	2	0	0	23	2	3	1	1	2	2	1	2	2	Epigastric hernia
4	45	1	1	2	2	2	1	71	2	0	0	22.6	2	2	2	2	2	2	1	2	2	Lap cholecystectomy
5	56	2	1	2	2	2	2	58	2	1	0	23.8	2	2	2	2	2	2	1	2	2	Lt hemicolectomy & Colostomy
6	57	2	1	2	2	2	1	67	2	0	0	23	2	1	2	2	2	2	1	2	2	Epigastric hernia
7	63	3	1	1	2	2	2	42	3	1	0	26	3	2	4	2	1	2	1	2	3	Inguinal hernia
8	68	3	1	2	2	2	2	61	2	0	0	23.2	2	2	2	2	2	2	1	2	2	Inguinal hernia
9	65	3	2	2	3	2	1	64	2	0	0	23	2	3	1	1	2	2	1	2	2	Incisional hernia upper
10	66	3	1	2	2	2	2	40	3	2	0	24.3	2	2	3	2	2	2	1	2	3	Inguinal hernia
11	63	3	1	1	1	1	3	36	3	2	1	23.4	2	1	3	2	2	2	1	2	3	ABFB
12	42	1	1	2	2	2	1	67	2	0	0	22.4	2	2	2	2	2	2	1	2	2	Lap cholecystectomy
13	49	1	1	2	2	2	0	82	1	0	0	26	3	2	2	2	2	1	1	2	2	Whipples
14	47	1	1	1	2	1	1	69	2	0	0	21.8	2	2	2	2	2	2	1	2	2	IFB
15	58	2	2	2	2	2	1	81	1	0	0	22.6	2	3	1	1	2	2	1	2	1	Lap cholecystectomy
16	72	4	1	2	2	2	2	53	2	1	0	21	2	2	3	2	2	2	1	1	2	Inguinal hernia
17	62	3	2	1	1	1	3	36	3	2	1	23.2	2	3	1	1	2	2	1	1	3	Incisional hernia lower
18	41	1	1	2	2	2	1	56	2	1	0	24.2	2	2	3	2	2	2	1	2	2	Incisional hernia upper
19	54	2	1	1	2	2	3	46	3	2	1	24	2	1	3	2	2	2	1	2	3	Inguinal hernia
20	60	3	1	1	1	1	1	58	2	1	0	23.7	2	2	2	2	2	2	1	2	2	IFB
21	64	3	1	2	2	2	0	82	1	0	0	22.8	2	3	1	2	2	2	1	2	1	Open cholecystectomy
22	59	2	1	1	1	2	2	48	3	1	0	21.4	2	1	3	2	2	2	1	2	3	Inguinal hernia
23	53	2	2	2	2	2	1	51	2	0	0	22.6	2	3	1	1	2	2	1	2	2	Lap cholecystectomy
24	65	3	1	2	2	2	2	54	2	0	0	23.4	2	2	3	2	2	2	2	2	2	IFB
25	51	2	1	1	2	2	2	58	2	1	0	23.5	2	2	4	2	2	2	1	2	2	Lap hernia
26	44	1	1	2	2	2	1	67	2	0	0	21.6	2	1	2	2	2	2	1	2	2	Nephrectomy
27	63	3	1	1	1	2	2	58	2	1	0	20.6	2	2	3	2	2	2	1	2	2	Inguinal hernia
28	49	1	1	2	2	2	1	58	2	0	0	22.4	2	2	3	2	2	2	1	2	2	IFB
29	52	2	1	2	2	2	2	67	2	0	0	20.2	2	2	2	2	2	2	1	2	2	Lap cholecystectomy
30	62	3	2	2	2	2	1	58	2	0	0	22.4	2	3	1	1	2	2	1	2	2	Epigastric hernia
31	47	1	1	1	2	1	1	52	2	1	1	23.5	2	2	3	2	2	2	1	2	2	Whipples
32	58	2	1	2	2	2	2	41	3	1	0	25.2	3	2	4	2	1	1	1	2	3	Inguinal hernia
33	66	3	1	1	1	2	2	42	3	2	0	25.6	3	2	3	2	2	2	1	2	3	Inguinal hernia
34	54	2	1	2	2	2	0	81	1	0	0	22.1	2	3	1	2	2	2	1	2	1	Whipples
35	49	1	2	1	2	2	1	54	2	0	0	27.2	3	3	1	1	2	2	1	2	2	Lap cholecystectomy
36	65	3	1	2	2	2	2	69	2	0	0	21.5	2	2	2	2	2	2	1	2	2	Incisional hernia upper
37	52	2	2	2	2	2	1	67	2	0	0	24.2	2	3	1	1	2	2	1	2	2	Lap cholecystectomy
38	50	2	1	1	2	1	2	68	2	0	0	25	3	3	1	2	2	2	1	2	2	Epigastric hernia
39	48	1	1	1	1	1	3	35	3	2	1	23.5	2	2	3	2	2	2	1	2	3	Frey
40	48	1	1	1	2	2	2	44	3	2	1	24.7	2	2	3	2	2	2	1	2	3	Spleenectomy
41	43	1	1	2	2	2	2	64	2	1	0	22.7	2	2	2	2	2	2	1	2	2	Lap hernia
42	44	1	1	2	2	2	2	73	2	0	0	29.6	3	2	2	2	2	2	1	2	2	Whipples
43	50	2	1	1	1	2	2	54	2	1	0	30.6	4	1	3	2	2	2	1	2	2	Small bowel resection
44	72	4	1	1	1	2	3	48	3	3	1	29.5	3	2	4	2	1	2	2	2	3	Inguinal hernia
45	68	3	2	1	2	2	3	40	3	1	0	20.9	2	3	1	1	2	2	1	1	3	Incisional hernia lower
46	45	1	1	2	2	2	2	48	3	2	0	25.3	3	2	3	2	2	1	1	1	3	Inguinal hernia
47	44	1	1	2	2	2	3	59	2	1	0	24.6	2	1	3	2	2	2	1	2	2	Whipples
48	47	1	1	1	2	1	2	53	2	0	1	22.3	2	1	2	2	2	2	1	2	2	Open cholecystectomy
49	73	4	1	1	2	2	3	48	3	1	0	26.7	3	1	3	2	2	2	1	1	3	Inguinal hernia
50	65	3	1	1	1	1	3	49	3	2	0	22.8	2	2	4	2	2	2	1	2	3	IFB
51	55	2	1	2	2	2	2	59	2	0	0	21.6	2	1	3	2	2	2	1	2	2	Whipples
52	64	3	1	1	2	2	2	46	3	0	0	27.3	3	1	4	2	2	2		2	3	APR
53	57	2	1	2	2	2	2	61	2	0	0	25	3	2	3	2	2	2	1	2	2	IFB
54	45	1	2	2	2	2	1	82	1	0	0	23.5	2	3	1	1	2	2	1	2	1	Nephrectomy
55	42	1	1	2	2	2	1	66	2	0	0	24.7	2	2	1	2	2	2	1	2	2	Lap hernia
56	52	2	2	1	2	2	1	59	2	0	0	22.7	2	3	1	1	2	2	1	1	2	Incisional hernia lower
57	48	1	1	1	2	2	2	52	2	0	0	29.6	3	1	3	2	1	1	1	2	2	gastrectomy
58	51	2	1	1	2	1	2	57	2	0	0	26.7	3	2	2	2	2	2	1	2	2	IFB
59	49	1	1	2	2	2	1	81	1	0	0	30.4	4	2	1	2	2	2	1	2	1	Whipples
60	55	2	1	1	2	1	3	58	2	0	0	20.9	2	2	2	2	2	2	1	2	2	IFB
61	67	3	2	1	1	2	3	46	3	1	1	25.3	3	3	1	1	2	2	1	2	3	Epigastric hernia
62	58	2	1	2	2	1	0	79	2	0	0	24.6	2	3	1	2	2	2	1	2	2	Lap hernia
63	48	1	1	1	2	1	1	68	2	0	0	22.3	2	2	2	2	2	2	1	2	2	IFB
64	47	1	1	1	2	2	2	59	2	0	0	26.7	3	1	3	2	2	2	1	2	2	Lap cholecystectomy
65	51	2	1	1	1	2	2	40	3	2	1	22.8	2	1	4	2	2	2	1	1	3	Inguinal hernia
66	54	2	1	1	2	1	1	77	2	0	0	21.6	2	3	1	2	2	2	1	2	2	Lap hernia
67	62	3	2	1	1	1	3	29	4	3	2	16.6	1	3	1	1	2	2	1	2	4	Incisional hernia lower
68	68	3	1	2	2	2	2	46	3	2	0	24.2	2	2	4	2	2	2	1	2	3	Inguinal hernia
69	60	3	1	1	2	1	2	56	2	2	0	25.2	3	2	2	2	2	2	1	2	2	Lap hernia
70	58	2	2	2	2	2	2	54	2	0	0	20	2	3	1	1	2	2	1	2	2	Lap cholecystectomy
71	62	3	1	1	2	1	1	65	2	0	0	20.3	2	2	2	2	2	2	1	2	2	ABFB
72	50	2	1	2	2	2	2	54	2	1	0	24.6	2	2	2	2	2	2	1	2	2	Lap cholecystectomy
73	49	1	1	1	2	2	1	76	2	0	0	23.4	2	3	1	2	2	2	1	2	2	Epigastric hernia
74	60	3	2	1	2	2	3	42	3	2	0	21.3	2	3	1	1	2	2	1	1	3	Incisional hernia lower
75	49	1	1	1	1	1	2	48	3	1	1	20.8	2	1	3	2	2	2	1	2	3	ABFB
76	47	1	1	2	2	2	0	82	1	0	0	27.4	3	2	2	2	1	2	1	2	2	Lap cholecystectomy
77	54	2	2	2	2	2	2	57	2	0	0	28.2	3	3	1	1	2	1	1	2	2	Incisional hernia upper
78	57	2	1	1	2	1	2	55	2	0	0	21.4	2	1	3	2	2	2	1	1	2	Lap hernia
79	59	2	2	1	2	1	2	58	2	0	0	22.4	2	3	1	1	2	2	1	2	2	Left hemicolectomy with Colostomy
80	62	3	1	1	1	2	3	47	3	2	1	21.2	2	2	4	2	2	2	1	2	3	Colostomy reversal
81	61	3	1	2	2	2	1	72	2	0	0	23.2	2	3	1	2	2	2	1	2	2	IFB
82	58	2	1	2	2	2	0	83	1	0	0	20.1	2	2	2	2	2	2	1	2	2	Lap cholecystectomy
83	42	1	1	2	2	2	1	69	2	0	0	22.1	2	2	2	2	2	2	1	2	2	Lap cholecystectomy
84	57	2	2	2	2	2	1	64	2	0	0	23	2	3	1	1	2	2	1	2	2	Lap cholecystectomy
85	58	2	1	2	2	1	1	62	2	0	0	26.6	2	1	2	2	2	2	1	2	2	Lap hernia
86	48	1	1	1	2	1	2	51	2	1	0	26.4	3	2	4	2	2	2	1	2	2	IFB

87	59	2	2	1	2	1	1	62	2	0	0	28.7	3	3	1	1	1	2	1	2	2	ABFB
88	60	3	1	2	2	2	2	54	2	0	0	23.4	2	1	4	2	2	2	1	2	2	Colostomy reversal
89	49	1	1	1	2	1	1	56	2	0	0	22.9	2	1	3	2	2	1	1	2	2	IFB
90	54	2	1	1	2	2	2	57	2	0	0	21.7	2	2	2	2	2	2	1	2	2	Lap cholecystectomy
91	69	3	2	1	1	2	2	46	3	2	0	20.1	2	3	1	1	2	2	1	1	2	Epigastric hernia
92	65	3	1	1	2	2	2	48	3	2	0	21.1	2	1	3	2	2	2	1	2	3	Inguinal hernia
93	65	3	1	1	2	2	2	46	3	2	0	22.2	2	2	3	2	2	2	1	1	3	Inguinal hernia
94	59	2	1	2	2	2	1	64	2	0	0	22.6	2	2	1	2	2	2	1	2	2	Lap hernia
95	49	1	1	2	2	2	1	70	2	0	0	19.4	2	1	2	2	2	2	1	2	2	Whipples
96	53	2	1	1	1	1	1	56	2	2	1	27.3	3	2	3	2	2	2	1	2	2	Whipples
97	62	3	2	1	2	2	2	48	3	0	1	22	2	3	1	1	2	2	1	1	3	Lap inguinal hernia
98	51	2	1	1	1	1	2	44	3	1	1	17.1	1	2	4	2	2	2	1	2	3	Whipples
99	61	3	1	1	2	2	2	51	2	1	0	26.4	3	1	3	2	2	2	1	2	2	Left hemi colectomy
100	60	3	1	1	1	2	3	37	3	2	1	24.9	3	2	4	2	2	2	1	2	3	Inguinal hernia
101	55	2	1	1	1	1	1	53	2	1	0	22	2	1	3	2	2	2	1	2	2	Epigastric hernia
102	57	2	1	1	1	2	2	57	2	0	0	22.3	2	2	2	2	2	2	1	2	2	Lap cholecystectomy
103	67	3	2	2	2	2	1	64	2	0	0	19.6	2	3	1	1	2	2	1	2	2	Incisional hernia upper
104	47	1	1	2	2	2	0	73	2	0	0	26.7	3	2	2	2	2	2	1	2	2	Lap cholecystectomy
105	54	2	1	1	1	1	2	56	2	0	0	19.7	2	1	4	2	2	2	1	2	2	Epigastric hernia
106	57	2	1	1	2	2	2	45	3	2	0	21	4	2	3	2	2	2	1	2	3	Inguinal hernia
107	59	2	1	1	1	2	3	38	3	3	1	25.7	3	2	4	2	2	2	1	2	3	Inguinal hernia
108	60	3	2	1	1	2	1	52	2	2	0	19.9	2	3	1	1	2	2	1	2	2	Lap cholecystectomy
109	56	2	1	1	2	2	1	63	2	0	0	18.8	2	1	2	2	2	2	1	2	2	Lap cholecystectomy
110	62	3	1	1	1	2	1	38	3	1	0	20	2	2	3	2	2	2	2	1	3	Inguinal hernia
111	61	3	1	2	2	1	1	67	2	0	0	23.2	2	2	2	2	2	2	1	2	2	Lap hernia
112	58	2	1	1	2	1	2	52	2	1	0	26.4	3	2	3	2	1	2	1	2	2	IFB
113	58	2	1	1	1	2	2	45	3	2	1	22.3	2	1	2	2	2	2	1	2	3	Whipples
114	42	1	1	1	2	2	1	62	2	0	0	17.6	1	2	2	2	2	2	1	2	2	Pyeloplasty
115	57	2	1	1	1	2	1	59	2	0	0	22	2	2	2	2	2	2	1	2	2	ABFB
116	56	2	1	1	1	2	2	57	2	0	0	22.6	2	2	2	2	2	2	1	2	2	Lap hernia
117	44	1	1	1	2	2	2	65	2	0	0	19.2	2	2	3	2	2	2	1	2	2	Lap cholecystectomy
118	48	1	1	2	2	2	1	71	2	0	0	21.6	2	2	2	2	2	2	1	2	2	Lap cholecystectomy
119	61	3	2	1	2	2	2	49	3	1	1	24.2	2	3	1	1	2	2	1	1	3	Epigastric hernia
120	52	2	1	2	2	2	1	66	2	0	0	19.7	2	2	2	2	2	2	1	2	2	Lap cholecystectomy
121	65	3	2	2	2	2	1	56	2	0	0	21.4	2	3	1	1	2	2	1	2	2	Incisional hernia lower
122	49	1	1	2	2	2	0	82	1	0	0	25.7	3	1	2	2	1	1	1	2	2	Inguinal hernia
123	53	2	1	2	2	2	1	54	2	0	0	20	2	2	3	2	2	2	1	2	2	Lap cholecystectomy
124	61	3	1	1	1	2	3	38	3	2	1	22.3	2	2	3	2	2	2	1	1	3	Inguinal hernia
125	58	2	1	2	2	1	1	51	2	0	0	17.8	1	2	3	2	2	2	1	2	2	IFB
126	55	2	2	1	2	1	1	57	2	0	0	19.2	2	3	1	1	2	2	1	2	2	Small bowel resection
127	56	2	1	1	1	1	2	52	2	1	0	24.2	2	2	3	2	2	2	1	2	2	Open Cholecystectomy
128	47	1	1	1	2	1	1	59	2	0	0	20.3	2	1	2	2	2	2	1	2	2	IFB
129	62	3	2	2	2	2	3	55	2	1	0	25.2	3	3	1	1	2	2	1	2	2	Incisional hernia lower
130	57	2	1	1	2	1	1	66	2	0	0	23.2	2	2	2	2	2	2	1	2	2	IFB
131	43	1	1	2	2	2	1	53	2	1	0	30.5	4	1	4	2	1	2	1	2	2	ABFB
132	47	1	1	1	2	1	1	61	2	0	0	23.2	2	2	2	2	2	2	1	2	2	Lap hernia
133	57	2	2	1	2	2	1	61	2	0	0	22.1	2	3	1	1	2	2	1	2	2	Lap cholecystectomy
134	59	2	1	1	2	2	3	27	4	3	1	26.7	3	2	4	2	2	2	2	1	4	Inguinal hernia
135	47	1	1	2	2	2	0	74	2	0	0	22.4	2	2	2	2	2	2	1	2	2	Incisional hernia upper
136	44	1	1	2	2	2	0	82	1	0	0	23.6	2	3	1	2	2	2	1	2	1	Incisional hernia upper
137	52	2	1	2	2	2	1	55	2	1	0	20.2	2	1	3	2	2	2	1	2	2	Whipples
138	53	2	1	2	2	2	1	65	2	0	0	22.4	2	2	2	2	2	2	1	2	2	Nephrectomy
139	61	3	2	1	2	2	2	54	2	0	0	19.6	2	3	1	1	2	2	1	2	2	ABFB
140	58	2	1	2	2	1	1	73	2	0	0	26.7	3	2	3	2	2	2	1	2	2	IFB
141	49	1	1	1	1	2	2	43	3	1	0	18.5	2	2	4	2	2	2	1	2	3	ABFB
142	50	2	1	1	1	1	2	52	2	1	1	22.3	2	2	2	2	2	2	1	2	2	Inguinal hernia
143	62	3	1	2	2	2	2	57	2	0	0	20.7	2	2	2	2	2	2	1	2	2	gastrectomy
144	58	2	1	1	1	2	1	55	2	2	0	19.4	2	2	3	2	2	2	2	2	2	Inguinal hernia
145	57	2	1	2	2	2	1	59	2	0	0	22.3	2	1	3	2	2	2	1	2	2	Incisional hernia upper
146	55	2	1	2	2	2	1	71	2	0	0	22.5	2	2	2	2	2	2	1	2	2	Incisional hernia upper
147	64	3	2	1	1	2	2	39	3	3	2	23.2	2	3	1	1	2	2	2	1	3	Incisional hernia upper
148	41	1	1	1	2	2	1	65	2	0	0	18.3	1	1	2	2	2	2	1	2	2	Inguinal hernia
149	52	2	1	2	2	2	2	73	2	0	0	21.4	2	2	2	2	2	2	1	2	2	Lap hernia
150	56	2	1	1	2	1	1	54	2	1	0	28.1	3	1	3	2	1	1	1	2	2	IFB
151	45	1	1	2	2	2	2	68	2	0	0	19.1	2	2	3	2	2	2	1	2	2	Incisional hernia upper
152	56	2	2	1	1	2	2	43	3	2	0	21.2	2	3	1	1	2	2	1	1	3	Incisional hernia lower
153	57	2	1	1	1	2	2	51	2	2	1	30.3	4	2	2	2	2	2	1	2	2	Nephrectomy
154	68	3	1	1	2	2	2	59	2	0	0	18.1	1	3	1	1	2	2	1	2	2	Inguinal hernia
155	63	3	1	1	1	2	2	51	2	0	0	20.8	2	2	3	2	2	2	1	2	2	Inguinal hernia
156	64	3	1	1	2	2	1	43	3	1	0	23.4	2	2	3	2	2	2	1	1	3	Inguinal hernia
157	58	2	1	1	1	1	2	43	3	1	1	20.8	2	1	3	2	2	2	1	2	3	Right hemicolectomy with Colostomy
158	62	3	1	1	1	2	3	49	2	1	0	23.4	2	2	4	2	2	2	1	2	2	Inguinal hernia
159	61	3	1	1	1	2	2	59	2	1	0	20.6	2	2	3	2	2	2	1	2	2	Inguinal hernia
160	54	2	1	2	2	2	1	63	2	0	0	24.3	2	2	2	2	2	2	1	2	2	Lap hernia
161	56	2	2	1	1	2	2	49	3	0	0	20.8	2	3	1	1	2	2	1	1	3	Incisional hernia lower
162	64	3	1	1	2	2	1	54	2	1	0	23	2	1	2	2	2	2	1	2	2	Whipples
163	47	1	1	1	1	2	1	64	2	0	0	20.2	2	2	2	2	2	2	1	2	2	Inguinal hernia
164	44	1	1	2	2	2	0	82	1	0	0	25.2	3	2	2	2	1	2	1	2	2	Freys
165	52	2	1	1	1	2	1	52	2	1	0	24.6	2	2	3	2	2	2	1	2	2	Nephrectomy
166	56	2	1	1	2	2	2	54	2	0	0	16.6	1	2	3	2	2	2	1	2	2	Inguinal hernia
167	58	1	1	2	2	2	2	51	2	0	0	24.3	2	1	2	2	2	1	1	2	2	Lap hernia
168	52	2	2	2	2	2	1	59	2	0	0	21.2	2	3	1	1	2	2	1	2	2	Lap cholecystectomy
169	58	2	1	2	2	2	0	81	1	0	0	24.6	2	2	2	2	2	2	1	2	2	Right hemicolectomy with Colostomy

170	56	2	2	2	2	2	1	62	2	0	0	23.4	2	3	1	1	2	2	1	2	2	Lap cholecystectomy
171	62	3	1	1	1	2	3	35	3	2	1	21.3	2	2	4	2	2	2	1	1	3	Lap cholecystectomy
172	50	2	2	2	2	2	1	63	2	0	0	19.4	2	3	1	1	2	2	1	2	2	ABFB
173	70	4	1	1	1	2	3	29	4	2	0	27.3	3	2	4	2	2	2	1	1	4	Inguinal hernia
174	59	2	2	2	2	2	1	59	2	0	0	20.5	2	3	1	1	2	2	1	2	2	gastrectomy
175	67	3	1	1	2	1	2	43	3	1	1	26.4	3	1	4	2	2	2	1	2	3	Penectomy with lymphnode resection
176	56	2	2	2	2	2	1	58	2	1	0	24.9	2	3	1	1	2	2	1	2	2	Lap cholecystectomy
177	58	2	1	1	2	2	1	48	2	0	0	19.7	2	1	3	2	2	2	1	2	2	Inguinal hernia
178	63	3	1	2	2	2	0	82	1	0	0	20.2	2	2	2	2	2	2	1	1	2	IFB
179	67	3	1	1	2	2	2	45	3	1	0	20.3	2	3	1	1	2	2	1	2	3	Inguinal hernia
180	49	1	1	2	2	2	1	71	2	0	0	31.2	3	2	2	2	1	2	1	2	2	Open cholecystectomy
181	72	4	1	1	1	2	1	59	2	0	0	21.3	2	1	3	2	2	2	1	2	2	Incisional hernia lower
182	54	2	2	2	2	2	1	65	2	0	0	24.2	2	3	1	1	1	1	1	2	2	Lap cholecystectomy
183	59	2	1	1	1	2	2	39	3	2	0	16.6	1	3	1	1	2	2	1	1	3	Inguinal hernia
184	65	3	1	2	2	2	1	57	2	0	0	21.6	2	2	2	2	2	2	1	1	2	APR
185	63	3	1	2	2	2	1	55	2	0	0	24.6	2	2	2	2	2	2	1	2	2	Inguinal hernia
186	52	2	1	1	2	2	1	59	2	0	0	22.3	2	2	2	2	2	2	1	2	2	Lap hernia
187	66	3	1	2	2	1	1	52	2	1	0	20.9	2	2	2	2	2	2	1	2	2	Small bowel resection anastamosis
188	58	2	1	2	2	2	1	57	2	0	0	22.6	3	1	2	2	2	2	1	2	2	Inguinal hernia
189	74	4	2	1	2	2	2	53	2	1	0	22.7	2	3	1	1	2	2	2	2	2	Incisional hernia upper
190	76	4	1	2	2	2	1	59	2	0	0	24.7	2	2	2	2	2	2	1	1	2	Incisional hernia lower
191	57	2	1	2	2	2	1	72	2	0	0	23.5	2	2	2	2	2	2	1	2	2	Open cholecystectomy
192	49	1	1	1	2	2	1	52	2	0	0	30.6	4	1	4	2	2	2	1	2	2	ABFB
193	66	3	2	1	1	2	3	29	4	2	1	21.5	2	3	1	1	2	2	1	1	4	Inguinal hernia
194	53	2	1	2	2	1	2	52	2	0	0	29.6	3	2	2	2	1	2	1	2	2	Lap hernia
195	58	2	2	2	2	2	1	57	2	0	0	14.2	1	3	1	1	2	2	1	2	2	Lap cholecystectomy
196	63	3	1	2	2	2	1	71	2	0	0	17	1	2	2	2	2	2	1	2	2	Epigastric hernia
197	64	3	2	1	1	1	2	38	3	1	1	22	2	3	1	1	1	2	2	1	3	Incisional hernia lower
198	41	1	1	1	2	2	1	54	2	0	0	18.6	2	1	2	2	2	2	1	2	2	Incisional hernia upper
199	48	1	1	1	2	2	2	37	3	1	1	21.6	2	1	3	2	2	2	1	2	3	Left hemi colectomy
200	54	2	2	2	2	1	1	61	2	0	0	28	3	3	1	1	2	1	1	2	2	IFB
201	57	2	1	2	2	1	1	65	2	0	0	19.7	2	2	2	2	2	2	1	2	2	Lap hernia
202	66	3	2	1	1	2	1	41	3	1	1	19.2	2	3	1	1	2	2	1	2	3	Open Cholecystectomy
203	64	3	1	1	2	2	2	54	2	0	0	24	2	1	3	2	2	2	1	2	2	Inguinal hernia
204	46	1	1	2	2	1	1	52	2	1	1	17.2	2	2	3	2	2	2	1	2	2	ABFB
205	51	2	2	1	2	1	2	44	3	2	1	22.1	2	3	1	1	2	2	1	2	3	APR
206	57	2	1	2	2	2	0	80	1	0	0	23	2	3	1	2	2	2	1	2	1	Lap cholecystectomy
207	63	3	1	2	2	1	1	54	2	0	1	20.8	2	1	3	2	2	2	1	2	2	Lap cholecystectomy
208	54	2	1	2	2	2	0	71	2	0	0	24.3	2	2	2	2	2	1	1	2	2	Lap hernia
209	58	2	2	2	2	2	1	72	2	0	0	20.8	2	3	1	1	2	2	1	2	2	gastrectomy
210	56	2	1	1	2	1	1	62	2	0	0	23.4	2	2	2	2	2	2	1	2	2	Epigastric hernia
211	59	2	1	1	2	2	1	64	2	0	0	20.8	2	3	1	2	2	2	1	2	2	APR
212	41	1	1	1	2	2	1	55	2	0	0	18	1	2	2	2	2	2	1	2	2	Spleenectomy
213	80	4	2	1	1	2	2	42	3	1	0	21.2	2	1	3	1	2	2	2	2	3	Inguinal hernia
214	62	3	1	1	2	2	1	55	2	0	0	30.3	4	2	2	2	2	2	1	2	2	Inguinal hernia
215	64	3	2	2	2	2	1	58	2	0	0	19.1	2	3	1	1	2	2	1	2	2	Incisional hernia lower
216	54	2	1	2	2	2	1	62	2	0	0	28.1	3	2	2	2	1	2	1	2	2	Lap cholecystectomy
217	59	1	1	1	1	2	2	36	3	2	0	21.4	2	3	1	1	2	2	1	1	3	Inguinal hernia
218	52	2	1	2	2	2	2	55	2	0	0	18.3	1	1	3	2	2	2	1	2	2	Nephrectomy
219	55	2	1	2	2	1	1	65	2	0	0	23.3	2	2	2	2	2	2	1	2	2	Open cholecystectomy
220	42	1	1	1	2	2	1	64	2	0	0	22.5	2	2	2	2	2	2	1	2	2	Spleenectomy
221	48	1	1	2	2	2	2	52	2	1	0	22.3	2	2	3	2	2	2	1	2	2	Incisional hernia lower
222	52	2	1	2	2	1	2	57	2	0	0	19.4	2	1	2	2	2	2	1	2	2	IFB
223	68	3	1	1	1	1	3	26	4	2	1	20.7	2	2	3	2	2	2	1	2	4	IFB
224	58	2	2	1	1	2	1	48	2	0	0	22.3	2	3	1	1	2	2	1	2	2	Colostomy reversal
225	62	3	1	1	2	2	2	52	2	0	0	18.5	2	1	2	2	2	2	1	2	2	Inguinal hernia
226	56	2	1	2	2	2	2	52	2	0	0	24.2	2	2	3	2	2	2	1	2	2	APR
227	59	2	1	2	2	2	1	59	2	0	0	21.6	2	2	2	2	2	2	1	2	2	Lap hernia
228	61	3	1	2	2	1	0	85	1	0	0	30.2	4	3	1	2	2	2	1	2	1	IFB
229	47	1	1	1	2	1	1	62	2	0	0	19.3	2	1	2	2	2	2	1	2	2	IFB
230	49	1	1	2	2	2	1	67	2	0	0	22.6	2	2	2	2	2	2	1	2	2	Freys
231	53	2	2	2	2	1	1	69	2	0	0	22	2	3	1	1	2	2	1	2	2	Lap cholecystectomy
232	54	2	1	1	2	2	2	51	2	0	0	17.3	1	2	3	2	2	2	1	1	2	Colostomy reversal
233	63	3	1	1	1	1	1	55	2	0	0	22.3	2	1	4	2	2	2	1	2	2	Lap inguinal hernia
234	57	2	1	2	2	2	0	74	2	0	0	26.4	3	3	1	2	2	2	1	2	2	Lap cholecystectomy
235	47	1	1	1	1	2	2	46	3	1	1	22.4	2	2	4	2	2	2	1	2	3	ABFB
236	43	1	1	2	2	2	0	72	2	0	0	20	2	1	2	2	2	2	1	2	2	Lap cholecystectomy
237	48	1	1	2	2	2	1	70	2	0	0	18.8	2	2	2	2	2	2	1	2	2	Lap cholecystectomy
238	57	2	2	1	2	2	1	59	2	0	0	19.9	2	3	1	1	2	2	1	1	2	Incisional hernia lower
239	58	2	1	1	2	2	1	52	2	0	0	30.6	3	2	3	2	1	1	1	2	2	Whipples
240	64	3	2	1	1	2	2	56	2	1	0	21.4	2	3	1	1	2	2	1	2	2	Inguinal hernia
241	66	3	1	1	2	2	1	56	2	0	0	26.2	2	1	3	2	2	2	1	2	2	Inguinal hernia
242	61	3	1	2	2	2	1	62	2	0	0	19.6	2	2	2	2	2	2	1	2	2	gastrectomy
243	45	1	1	2	2	2	1	83	1	0	0	22.3	2	2	2	2	2	2	1	2	2	Whipples
244	49	1	2	2	2	2	0	67	2	0	1	22.6	2	3	1	1	2	2	1	2	2	Open cholecystectomy
245	52	2	1	1	2	2	1	54	2	0	0	25	3	1	3	2	2	2	1	2	2	Left hemicolectomy with Colostomy
246	54	2	1	1	1	2	2	45	3	1	0	26.5	3	1	3	2	1	2	2	2	3	IFB
247	56	2	2	1	2	2	1	52	2	0	0	17.9	1	3	1	1	2	2	1	2	2	Lap cholecystectomy
248	57	2	1	1	2	2	1	55	2	0	1	27	3	2	2	2	2	2	1	2	2	APR
249	51	2	2	1	1	2	1	61	2	0	0	20	2	3	1	1	2	2		2	2	Lap cholecystectomy

MODE OF SURGERY	TYPE OF ANAESTHESIA	SURGICAL INCISION SITE	DURATION OF SURGERY	PPC	PNEUMONIA	ATELECTASIS	PLEURAL EFFUSION	EXACREBATION OF COPD	ON MECHANICAL VENTILITAION > 48 HRS	UNPLANNED REINTUBATION	RESPIRATORY FAILURE	PULMONARY EMBOLISM	DIED	POST SURGERY DURATION OF HOSPITAL STAY IN DAYS	LENGTH OF ICU STAY IN DAYS	ARISCAT SCORE	ARISCAT SCORE RANGE	POSTOP CARDIAC COMPLICATION	INTRAOP BLOOD TRANSFUSION
1	2	2	1	2	2	2	2	2	2	2	2	2	2	3	0	3	1	2	2
1	1	1	3	2	2	2	2	2	2	2	2	2	2	8	1	58	3	2	2
1	2	1	1	2	2	2	2	2	2	2	2	2	2	3	0	18	1	2	2
2	1	1	2	2	2	2	2	2	2	2	2	2	2	3	0	31	2	2	2
1	1	1	3	1	1	2	2	2	2	2	2	2	2	15	4	41	2	2	1
1	2	1	1	2	2	2	2	2	2	2	2	2	2	3	0	18	1	2	2
1	2	2	1	2	2	2	2	2	2	2	2	2	2	3	0	3	1	2	2
1	2	2	1	2	2	2	2	2	2	2	2	2	2	3	0	3	1	2	2
1	2	1	1	2	2	2	2	2	2	2	2	2	2	3	0	18	1	2	2
1	2	2	1	2	2	2	2	2	2	2	2	2	2	3	0	3	1	2	2
1	1	1	3	1	1	2	2	2	1	2	1	2	1	died (10)	died (10)	58	3	1	1
2	1	1	2	2	2	2	2	2	2	2	2	2	2	3	0	31	2	2	2
1	1	1	3	2	2	2	2	2	2	2	2	2	2	9	0	38	2	2	1
1	2	2	2	2	2	2	2	2	2	2	2	2	2	5	0	33	2	2	2
2	1	1	2	2	2	2	2	2	2	2	2	2	2	3	0	34	2	2	2
1	2	2	1	2	2	2	2	2	2	2	2	2	2	3	0	14	1	2	2
1	2	2	1	1	2	1	2	1	2	2	2	2	2	8	0	32	2	2	2
1	2	1	1	2	2	2	2	2	2	2	2	2	2	3	0	18	1	2	2
1	2	2	1	2	2	2	2	2	2	2	2	2	2	3	0	3	1	2	2
1	2	2	2	1	1	2	2	2	2	2	2	2	2	10	0	36	2	2	2
1	1	1	1	2	2	2	2	2	2	2	2	2	2	6	0	35	2	2	2
1	2	2	1	2	2	2	2	2	2	2	2	2	2	3	0	3	1	2	2
2	1	1	2	2	2	2	2	2	2	2	2	2	2	3	0	34	2	2	2
1	2	2	2	1	2	1	2	2	2	2	2	2	2	9	0	27	2	2	2
2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	0	3	1	2	2
1	1	1	3	2	2	2	2	2	2	2	2	2	2	9	2	38	2	2	2
1	2	2	1	2	2	2	2	2	2	2	2	2	2	3	0	3	1	2	2
1	2	2	1	2	2	2	2	2	2	2	2	2	2	6	0	0	1	2	2
2	1	1	2	2	2	2	2	2	2	2	2	2	2	4	0	34	2	2	2
1	2	1	1	2	2	2	2	2	2	2	2	2	2	3	0	35	2	2	2
1	1	1	3	1	1	2	2	2	1	2	1	2	2	16	5	55	3	2	1
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2	1	1	2	2	2	2	2	2	2	2	2	2	2	3	0	34	2	2	2